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Good and Bad Contractors

WE ought all to know what a registered contractor is, what he ought to be, what he ought to do; but, frankly, do we?

Does the public know the difference between a registered and an unregistered contractor? Does it understand for what the letters "N.R.E.I.C." stand?

Can the public tell the difference between the meaning of the letters E.C.A., N.R.E.I.C.—the authorised or official descriptions—and some mysterious letters which are being used by firms who, though they do contracting work, have not qualified for official recognition, but are able to pass muster because of public ignorance and because payment of a fee has enabled them to describe themselves as members of some organisation or other?

The use of the letters "C.E." never misled engineers into the belief that the man who assumed them was a consulting, or any other kind of qualified, engineer, but have they not often sufficed to impress those who had power to influence business? In the same way, letters at present appearing upon the correspondence paper of men or firms who have "taken up" contracting work may lead the uninformed public into the belief that the user is approved by some authoritative body or other as qualified to carry out good-class work.

We recognise that this leads us to a reiteration of the emphatic call for more widespread publicity to be given to Registration and what it stands for.

In the main, it stands for good and reliable work; we should like to be able to add with equal assurance that it means prompt and efficient *service*. Unfortunately, this is far from being always the case. Without it, business-like electricity supply is bound to be handicapped.

Those responsible for the additions to and revision of the Register have a standard which is so strictly applied that they sometimes at a single sitting reject more applications than they accept. As was shown at the last annual meeting, about a score of the Registered 1,400 were accused during the year of doing bad work. Of this score who were found out thirteen were let off with a caution. But the Register is very difficult—indeed impossible—to work without a large body of inspectors to investigate staff, equipment and other arrangements and changes, and to report on the quality of work done.

The Association of Supervising Electrical Engineers in recent conference heard from its delegates serious complaints of bad workmanship in installation work in the provincial areas, and such a state of things was, naturally, felt to be detrimental to the best interests of the industry in any case, but doubly serious because the complaints were against members of the National Register. In the current issue of its *Journal* the Supervisors' Association asks its members to bring before its head office full details of any cases of bad workmanship and unprofessional conduct on the part of registered contractors. This should be done to assist in the maintenance of a proper standard.

We hope that the Executive Committee of the Register is making headway with the scheme for obtaining increased revenue and the appointment of additional inspectors.

What we need to do is to secure that N.R.E.I.C. shall always stand for good workmanship and good service, and that the public shall be made to know it.

The contractor who has his authority displayed in a frame for the public information should have a boldly printed poster beside it telling what a Registered Contractor gives:—Good work, fair dealing, day and night service, and reasonable tradesman's credit.

The "Small man"

WE have often welcomed the small man into the contracting world, but, unfortunately, in recent years it has been plainly brought home to us that frequently the very small man cannot employ the best workmen or have them available when wanted; he cannot give a night service; sometimes he wants his money on the doorstep. In some areas the consolidation of several small businesses, which merely eke out a hand-to-mouth existence, into one local company of standing, could give the consumer the required service where the municipality or company supplying electricity is too detached in its attitude and in its powers to do its rightful work. No relief of responsibility should be given to the supply undertaking. It has a duty to all its consumers; but where it desires to work through contractors it cannot fulfil its responsibility unless it is able to recommend or deal with those who are fully qualified and can be relied upon.

In Times of Adversity

IT is commonly reported that when once upon a time Pharaoh had a very restless night he dreamed that seven lean kine came up out of the river and devoured seven fat-fleshed ones without effecting any improvement in their own appearance. In some industries observers might find an interesting application for that story, but what has it to do with *us* in this Christmas Day issue of the ELECTRICAL REVIEW? His Pharaohtic Majesty was advised in times of plenty to prepare for adversity, and very good counsel it was, too, but in modern industry it is also wise to take advantage of the slack years to prepare for the fatter ones to come. This, at any rate, is what Mr. Frank Parkinson last Friday told his shareholders that their company was doing. Now the last fifteen months, notwithstanding its good dividend, was a lean kined of year for Crompton-Parkinson, but the directors, being wise virgins, have been using the quieter times in trimming their lamps in readiness for when they have to burn the midnight oil in meeting bridegrooms or in the execution of the coming rush of business. For if one reads the speech one cannot fail to find therein a sure and certain hope. And it will do us all good in these last days of the year to catch the spirit which permeates it.

Prepare for Prosperity!

DURING the period of relief from manufacturing pressure every line of product has been improved either in design, in quality, or in method of production; new manufactures have been added; new fields for expansion have been explored; and a special technical and commercial staff for railway electrification has been set up, including experienced and prominent electrical engineers in the traction field. Manufacturing operations in this department are in progress at Chelmsford and a considerable increase in earning capacity is looked for from a branch of development which cannot be ignored by a National Government, especially with Mr. Pybus in command. Then the new lamp works, already overwhelmed with orders, are being expanded and the equipment improved ready for the bigger demand of which there are already signs. And to complete the story the order-books are better filled to-day than at any time during the past fifteen months. This is the sort of thing we like to read. The toast for Christmas Day, 1931, is: "Gentlemen! The Industry! "

Economy Proposals

SOME municipal corporations in their efforts to secure economies in connection with their electricity departments have got on to very interesting ground. Hackney Electricity Committee, for example, has expressed itself as entirely in agreement with the opinion of its Council's Economy Committee, and the Peterborough Council considers that attention should be given to the increasing amount of contributions which have to be made toward the expenses of the Central Electricity Board, the Electricity Commissioners and the Joint Electricity Authority. It is held that the "amounts which have to be contributed to these outside statutory bodies attached to electricity undertakings, are far in excess of what they should be." It is felt that the Government and other authorities should be approached, the time having arrived "for economies to be exercised in this direction."

Not in 1932

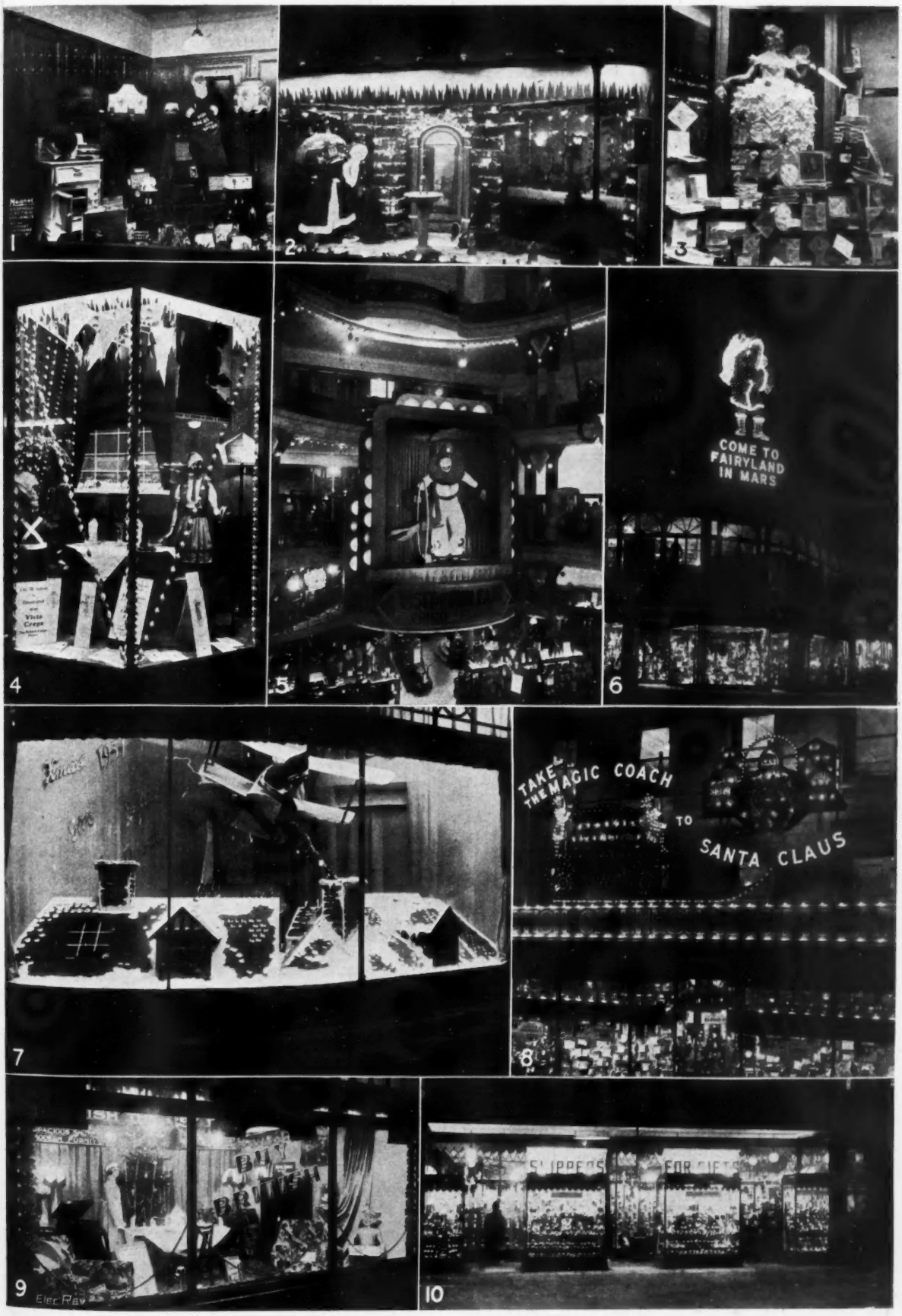
A STRAW which shows which way the wind is blowing for 1932 convention proceedings, already suggestively alluded to here, is a recommendation from the Hackney Electricity Committee that as "owing to the National Financial crisis economies must be exercised," the Council do not appoint delegates to the Incorporated Municipal Electrical Convention at Cardiff in June next. It is not, however, proposed to ban the Conference of Local Authorities Owning Electricity Undertakings in Greater London—that is, of course, a smaller and a more domestic or local affair. If the Peterborough-Hackney I.M.E.A. movement proceeds far, the Cardiff meeting may be numerically small as well as of brief duration. And if other electrical bodies meet with similar discouragement, the position may yet arise when it will have to be considered whether one fairly well attended convention will not be better than three of another kind. What a splendid opportunity is thus provided for testing out the idea!

Abnormal Imports

WHAT was no doubt "anticipatory" dumping has led the President of the Board of Trade to make a third Abnormal Imports Duty Order. This is far more electrical than either of its predecessors, as it covers electric lamps and illuminating glassware, a host of small accessories, and radio valves. A memorandum published with the Order, which we quote in our "Business Notes" section, makes it clear that there has been a flood of these articles from abroad during the last month or two. The statistics of electrical imports during November, which we published in our last issue, showed that the value of imported lamps was more than double the figure for November, 1930. This tendency was even more marked in the "telegraph and telephone apparatus" section, which includes radio apparatus, a class covered by the first of these Orders, for the rise was from £153,596 to £489,359—over 200 per cent. The table also showed several other serious increases—at a time when our exports are falling—and so it is possible that later Orders may also have an electrical complexion.

Frequency Standardisation

THE supply authorities in Italy have considered frequency standardisation, but have decided against it on the ground of cost, but Mr. Dalla Verde implied that there was a possibility of overcoming the economic difficulty. In drawing deductions regarding British procedure, this question should not be regarded only from the point of view of power station interconnection, as we believe is often done. From the point of view of the purchaser, the lower cost of electrical apparatus designed for a standard frequency and the convenience of being able to use it in any supply area are probably the strongest arguments in favour of the decision we have come to in this country; and the cost of our frequency standardisation will be fully justified.



Christmas lighting in and around London

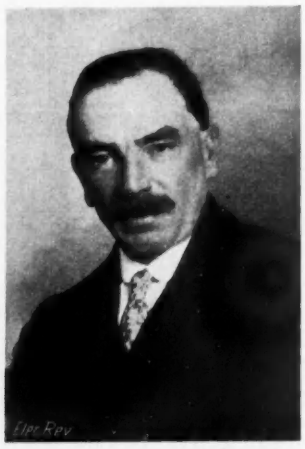
1. South London E.S. Corporation's showroom at Brixton; 2. North Metropolitan showroom, Palmer's Green; 3 & 4. Jones Bros.' stores, Holloway; 5. Whiteley's; 6. Arding & Hobbs, Clapham Junction; 7. Croydon Corporation showrooms; 8. Bon Marché, Brixton; 9. Jay's, Wood Green; 10. Lilley & Skinner's, Putney.

Domestic Load Development. By H. Wilson, A.M.I.E.E.

Encouraging increased use by suitable tariffs

THE development of the domestic load necessitates the removal of irksome restrictions and the offering of rates which become more favourable with increased use.

An intending customer in a great many cases has to fill in a fearful document known as an "application form," consisting of several sheets of closely printed abstruse matter with various perforated pieces to be torn off and retained. Further, he is sometimes asked to state how many watts he will require for various purposes, and sometimes even the ampères required. To a non-technical person this must represent quite an ordeal; I know one lady who promptly took it to her lawyer. The consumer should merely have to sign an addressed postcard asking the supply authority to connect up and supply electricity under the terms of the Special Order and the Electric Lighting Acts. The greater part of this postcard could then be devoted to office use.



[*Elliott & Fry*

Mr. H. Wilson, A.M.I.E.E., is Electrical Engineer to the Ashford Urban District Council

The next, and very important, matter is to have a tariff which will gently lead the consumer to use more electricity, and will not frighten him in the first instance with a quarterly charge which he has to pay, however little he uses, and which offers him little scope for economy in bad times. While a fixed-charge basis, either on rateable value, floor space, number of rooms, or apparatus installed is eminently satisfactory from the point of view of the supply authority, it always has been adversely criticised by the consumer.

Fixing the High-priced Units

I consider that the best alternative, and one which is likely to meet with the greatest approval from consumers, is based on a limited number of high-priced units, and I have found the slogan, "You only pay for what you use," to be a considerable help. Theoretically the number of high-priced units should be fixed by the total demand which the consumer makes at peak-load times. This is almost impossible without the use of expensive demand indicators, and even then some sort of time switch arrangement is a necessary adjunct in order not to penalise the consumer for high demand outside of peak-load hours.

On the old demand system disputes with consumers were frequent. I decided at Ashford to fix the number of high-priced units on the lighting watts installed, after deducting convenience lamps in cellars, bathrooms, lavatories, &c. There are several advantages in this method. To begin with, the consumer can check the number of high-priced units with which he should be charged, and the supply authority can name a guaranteed maximum cost for lighting.

In our case we charge 8d. per kWh for the first 10 kWh consumed per annum per 30-W lamp installed, ignoring convenience lights, apportioning one-eighth to each of the summer quarters and three-eighths to each of the winter quarters. The consumer is under no obligation to use this number, but the cost per kWh taken in excess falls to the heating rate of 1½d. After a similar number of units at 1½d., there is a further reduction to 1d. per unit.

Encouraging Other Uses

An advantage of this arrangement is that the consumer can use irons, kettles, small fires, &c., off his lighting circuits without increasing the 8d. units, and he therefore gets the benefit of the low rate without the expense and complication of a separate meter and wiring. Having become in this way familiar with the advantages of electricity, he very frequently goes in for a more extended use of larger appliances.

When consumers begin to use a considerable amount, they are encouraged to change over to our "guarantee" rate, under which they agree to use a definite amount per annum at nine-tenths of a penny per unit for all purposes, and one halfpenny per unit for consumptions over the guaranteed amount. The guaranteed amount varies from £12 per annum (3,200 units at 0.9d.) for a six-roomed house up to £135 per annum in the case of some of our hotels. A reduction to ¾d. per unit was made some two years ago and has proved well worth while, as it has led to a much more extended use of heating apparatus and water heaters.

Under this tariff it is possible for any consumer who uses a considerable amount of current to purchase it for all purposes at just under a penny per unit (even after adding 10 per cent. in the more remote rural areas). The average price paid by a good many consumers has been reduced to ¾d. per kWh.

Any charge to the prospective customer for service cables acts as a big deterrent to new business. I would suggest 45 ft. from the nearest edge of the road as a fairly liberal free allowance.

Assisted Wiring and Hiring Out

An assisted wiring scheme is an absolute necessity if we are to connect a large proportion of the possible houses—and *all* should be possible. I believe in recovering the cost of wiring by a small additional charge on the first 72 kWh used in each year, a figure that is generally exceeded. The consumer should be free of any obligation if he leaves the property, and the landlord cannot be held responsible for any payments; we have no difficulty in passing on the arrangement to the next tenant.

All the electrical contractors in the district should be given a live interest in the assisted wiring scheme, by arranging with them to do the work at a liberal price per point, the supply authority providing all material, which it can buy in large quantities at low prices.

I am sure that it is necessary to hire out domestic apparatus, and at as low rates as possible. Hire-purchase would be better from the undertaking's point of view, as the consumers would undoubtedly take more care of the apparatus, and the difficulties due to their wishing to change for newer models would not arise, but I do not think hire-purchase would lead to more than a quarter of the business which can be done with plain hire.

Here, again, I think it very desirable not to tie the customer up with irksome regulations, such as a requirement to keep a piece of apparatus for one or more years. It is much better to say: "Have it for a fortnight and, if you do not like it, we will fetch it back"; this inspires confidence at once. Hire terms should include up to a certain length of wiring, to avoid as far as possible any outlay on the part of the consumer.

The Financial Aspect of Hiring

The financial aspect of the hire business is very unsatisfactory. We hire a cooker costing £12 for 6s. per quarter. On a seven-year loan, interest and repayment come to 17 per cent., and allowing only 3 per cent. for maintenance (which is admittedly not enough), we ought to get at least 20 per cent. for an economic hire figure. This would mean an annual hire charge of 48s., which would be out of the question. Our charge of 24s. per annum leaves us with a loss of 24s. to be made up on profit from electricity supplied, and with normal use I believe this is quite possible.

The only course is to make the best of a bad job, and hope for the price of cookers to come down—as it is doing. But do not stop ordering until it does come down, or we shall never get there.

I consider water heating to be a better load than cooking, and I think that there is a very big field for storage water heaters, especially if they can be kept off peak load, either by a pilot-wire control system or by time switches.

If cookers and water heaters are let out at a low hire figure and with a low rate for electricity, I find that business will come along as quickly as it can be dealt with without placing too much stress on advertising and salesmanship. A reliable and obliging repair and maintenance service is absolutely essential.

The whole of the staff and workmen should be on the look out for new business; they can help a lot and, with a little encouragement, will do so. Above all, they should all use electricity for all possible purposes. We ought to take our own medicine.

Fresh Water from Salt Water

A new one-compartment cell for the direct electrolysis of salt water with very little electro-osmotic effect is described in a paper read by Prof. Jean Billiter before the United States Electro-chemical Society. The cell contains two diaphragms, one ceramic and the other of asbestos. It is claimed that the cells can be applied commercially to the purification of salt water, which contains normally from 0.2 to 1.0 per cent. of dissolved substances, at a lower cost than by distillation.

A Rural Electric Home. By G. S. Wilton, B.Sc., Grad.I.E.E.

Equipment of a Scottish dwelling and its cost

WHEN the Clyde Valley Electrical Power Co. extended its mains to Biggar, some thirty-five miles south-east of Glasgow, it offered the same tariff as in its Glasgow area, subject to a minimum guaranteed consumption, *viz.*, £1 per room plus ½d. per unit.

The altitude is nearly 1,000 ft., so that central heating is an inestimable boon. Hot water systems are expensive in first cost unless put in during building, and give a stuffy atmosphere. A tubular electric heating system, for thermostatic control at from 50 to 55 deg. F. was installed in one house in this district. This temperature is much healthier than 60 deg. F., and warmth with freedom from draughts is secured throughout the house for a moderate consumption of electricity. Radiators also are provided in most of the rooms.

The sitting-rooms measure on the average 24 ft. by 13 ft., and have large window areas. Two 7-ft. tube lengths in each, or the equivalent in shorter lengths, are found sufficient. In the hall some 10 ft. of tubing is used—three 2-ft. lengths near the stairs; a 2-ft. length in the hall wardrobe; and another 2-ft. length behind the umbrella stand—all controlled by one thermostat.

The bedrooms have a 7-ft. length in each, all controlled by a thermostat on the upper landing. The sum of the lengths of tubular heater provides only ½ watt per cu. ft. of air, but there are two coal fires in use throughout the winter. The result is highly satisfactory for comfort, and causes a marked drying effect. The installation is not expensive owing to the short lengths of the tubular heaters.

Every room has a 15-A plug, or two where a kettle might be used. Most of the radiators are Ferranti 1.2 and 2.4-kW models, though there are also some old radiators which have seen service since 1913 but are still efficient.

Water Heating

The 35-gal. circulating tank has been equipped with a 2-kW immersion heater controlled by a "Satchwell" thermostat. A towel rail in the bathroom is warm when required, that is, after drawing off hot water, as it is controlled by the same thermostat. Trouble was experienced in setting the thermostat owing to the water at the top of the tank being nearly boiling when that at the level of the thermostat was only warm. The correct setting of the thermostat was found at 100 deg. F., giving a satisfactory supply of water at 170 deg. F.; the position of the thermostat is about three inches below and parallel to the immersion heater.

Many contractors seem reluctant to fit thermostats to immersion heaters. Perhaps the necessity for experimenting to find the setting is one reason; another is the unreliability of many of the thermostats of the mercury-tube type, where the small movement available has to be very highly magnified and has to move the heavy tube with its leads. The result is that the setting taken up by the mercury tube for any specified temperature is not constant. I have known of electric water heaters fitted with these thermostats that have given trouble by boiling.

Cooking and Washing

A "Cosmos" 8-kW cooker is in use alone in the summer, and in conjunction with a coal range in the winter. Though the plates of this cooker are of the cast-solid type, they do not seem slow. The "Premier" three-pint kettle which is used takes 10 minutes to boil, while the same amount of water in an ordinary kettle takes 14 minutes on the largest plate. A 20-W pearl lamp is used as pilot; it is difficult to overlook, and its light over the cooker is often useful. The small consumption for cooking has been a great surprise. The failure of an oven element has showed the desirability of easily changed plug-in elements for rural consumers.

An electric washer has been steadily used for over a year. It is very effective, and is more than paid for by the saving in laundry bills.

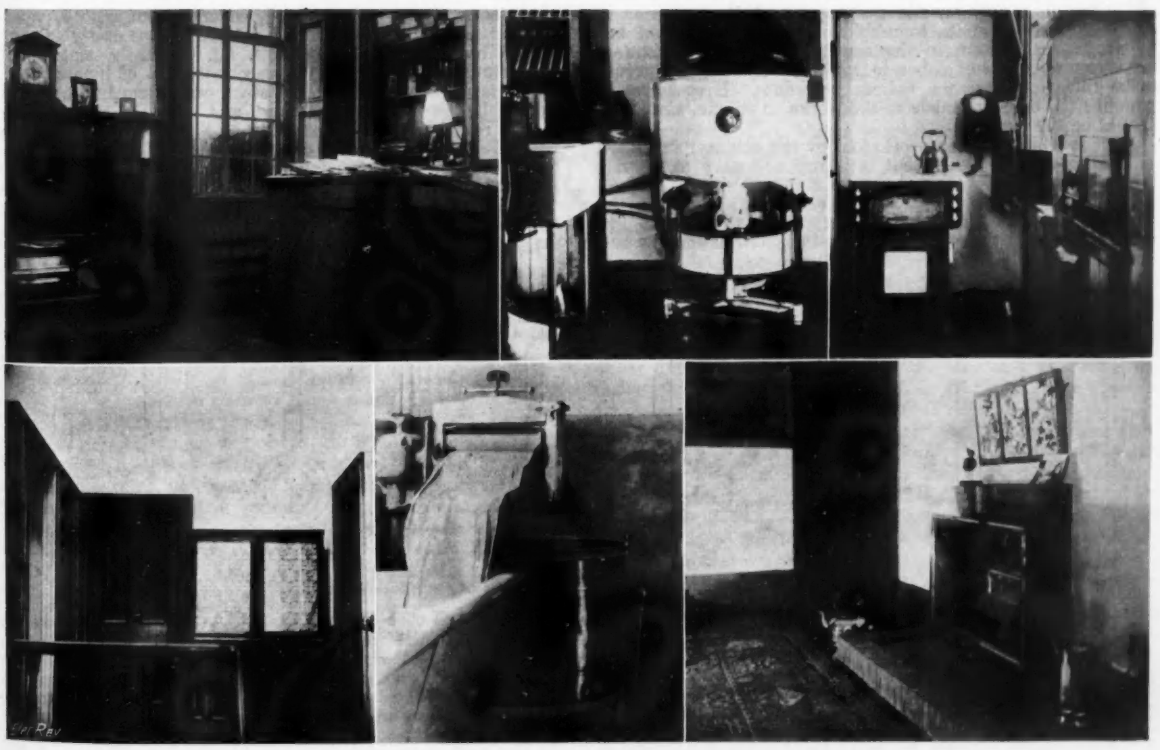
A Kent dish washer has been installed; this is a British machine.

A Modern Lighting Installation

Full advantage has been taken of the low rate to provide the best possible illumination. The sitting-rooms have been fitted with a special moulding lower than is usual for hanging pictures and of heavier section upon which are placed tubular lamps in reflectors, from six to ten per room.

The drawing room has two circuits, one with four 60-W amber sprayed and the other six 60-W clear lamps. The latter yield a light brilliant and of even intensity throughout the room with a restful absence of glare. The amber lamps are pleasant when the wireless is on, or during talk by the fire. If some firm were to put on the market lengths of similar moulding complete with lamps and wiring, it would furnish a simple means of wiring rooms for modern style lighting with the minimum of plaster breaking.

The upper landing is lit by hidden spot lamps above the glass "light" which is flush with the ceiling. The bedroom lamps are "portables" and are switched from the door *via* plugs. None of the ceilings is broken, and there is hardly any flex to be seen in the house. Lead covered wiring is used, but is little seen, largely due to the adoption of indirect lighting. A modified system of floodlighting is used for the main garden path.



Views of the interior of the house dealt with in this article

Useful Small Appliances

The radio-gramophone has novel features. The lid of the turntable portion slides to the left and articles placed on it need not be displaced to play records. The records are stored in a drawer. The aerial for the all-mains "Ediswan" set is

brought through the wall at the back of the cupboard, thus avoiding unsightly leads. The moving-coil loud speaker is on the opposite side of the room; this makes the a.c. hum inaudible and gives a better effect than when it is placed near its audience.

The saving of "elbow-grease" by the use of an electric polisher has been thoroughly appreciated, as there is a large area of wooden flooring to deal with. An electric blanket has been voted a great success and the pads, too, seem good. A bed-warmer that depended on accumulated heat would, however, be the better for a thermostatic switch, as it is easy to leave them in circuit too long. Our heater has been used very often for motor journeys in cold weather.

We have an electric toaster which is not satisfactory, for the loading 650 W, though apparently a common figure, must be too high, as the toast made is brown enough outside while still of putty consistency inside. Had one been available with a lower rated element, it would have been more often used. Special plugs have been fitted to the dining-room table lamp for connecting the toaster, &c.

Various types of immersion heaters have been in use. None, however, is any good for heating milk, owing to the too high loading for their surface area. The skin of burnt milk that covers them is exceedingly difficult to remove, even if the milk is not spoilt. A coffee percolator and a "Morganite" hot plate have been so much used as to have become quite commonplace. A vacuum sweeper that was bought about twenty years ago still works, which speaks well for electrical "servants."

These appliances have all been used by country servants, to whom they were quite new, without trouble.

The Force of Example

A car that is in daily use all the winter has a 250-W immersion heater soldered into the base of the radiator. It is switched on every night in the winter and has proved quite the best method of car warming tried, as the whole cylinder block is hot in the morning. Some electrical apparatus is used in the garden and outhouses.

It has been amusing to watch the effect of an electric house on one's neighbours. That it has an effect is likely in this small town, as among over ninety connections in the first year of electrification there are about half a dozen consumers with electric water heating and an equal number with cookers, although there is gas competition. If all electrical engineers were to demonstrate the "electrical way" in their own homes their example would go very far to "canvass" the country successfully.

The tables given below are self-explanatory. Some of the figures of electrical consumption are from sub-circuit meters; others are computed from the loading and duration of use, as some of the apparatus has not yet been in use a full year. The gradual transition from coal to gas and then to electricity can be seen.

PRESENT CONDITIONS

	kW.	kWh.
Tubular heating	6.0	8,032
Water heating	2.0	5,097
Radiators	12.0	2,060
Car heating	0.25	500
Washing and ironing	1.3	290
Kettle	1.2	90
Apparatus on test	2.5	—
Lighting	3.8	749
5-A plugs	4.25	404
Cooker and kettle	9.2	748
	42.5	17,920

Bill for electricity, £45; coal (8 tons), £16; *saving* due to washing machine £25 (at least). Net cost per annum, £36.

Some Previous Accounts

In 1929, prior to electrification, the annual bill for coal was £32, and, for paraffin, £2 10s. for lamps and £3 for occasional cooking, making a total expenditure of £37 10s.

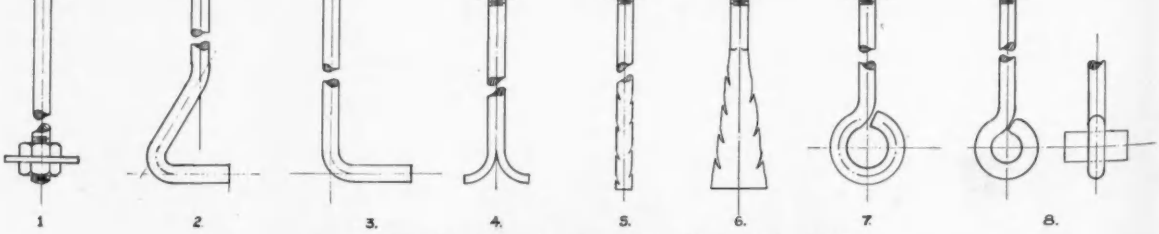
	1920. In Edinburgh.	1922. In Edinburgh.	1926. Near Edinburgh.
Coal	£21 0 0	£16 0 0	£11 10 0 (3)
Gas	16 10 0 (1)	17 10 0 (1)	22 10 0 (4)
Electricity	8 0 0 (2)	11 0 0 (2)	9 10 0 (5)
	£45 10 0	£44 10 0	£43 10 0

(1) Two gas fires, small cooker, and occasional water heating. (2) Lighting, vacuum cleaner and occasional heating. (3) Room heating only. (4) Includes coke for independent boiler, three gas fires and cooker. (5) Lighting only at 1s. per kWh.

Effective Foundation Bolts

IT frequently happens that the erecting engineer is called upon to supply on site the requisite bolts for securing the plant upon its foundation. Such bolts should not be an expensive item in the contract; nor is it absolutely necessary to prepare elaborate types of bolts which would make their installation a tedious procedure. Irrespective of whether the bolts are made at the works or on site, simplicity should be the keynote.

A point which is often overlooked by the engineer in regard to holding-down bolts is that it is not necessary to provide any anchorage other than the usual standard size of the bolt head so long as the length of the portion embedded in the concrete is at a depth equal to forty times the diameter of the bolt. Where the effective depth of concrete is shallow and does not allow the length of bolt above stipulated it is necessary to provide some suitable means of anchorage, and it is such anchorage which forms the most important feature of all foundation bolts.



Constructional features of various types of foundation bolts.

Fig. 1 shows a bolt which can be conveniently made with the tools usually to be found on site. The anchorage is formed by a large washer locked by nuts. The bolt illustrated in fig. 2 is simple to make, but it requires extra care in fixing. Whilst such a type is suitable for light machinery, it should not be employed to withstand great stresses. Similar remarks apply to the type shown in fig. 3. The writer limits the application of such types to the lighter class of plant. Fig. 4 is a type of bolt which has been in vogue for a very long time, and although easy to fashion it is very effective. The end can either be made curved as shown or arranged purely as a tee; in the latter shape the sharp angle sometimes weakens the anchorage.

With the type of bolt shown in fig. 5 the depth of burial is all-important. The writer has used this type of bolt with success for holding down fairly high-powered oil engines which have been placed upon existing concrete foundations, where the cutting of large area bolt holes proved too costly to carry out. The Lewis or ragged bolt, fig. 6, hardly needs any introduction; whilst being an excellent form of holding-down bolt, its usual short length of stock anchorage limits its use to the lighter class of machinery and plant.

The ring bolts shown in figs. 7 and 8 have an eye of large radius, at the extreme end in the former case, whilst the latter has a smaller eye, but is arranged with a small length of bar running centrally through the eye. Either of these bolts is very serviceable for securing both light and heavy plant, whilst the cost of all types mentioned will prove to be exceedingly low in comparison with some of the more complicated and special types of holding-down bolts which find their way to the hands of the erecting engineer.

Irrespective of which class of bolt is used, it is most important to ensure that, after final alignment of the plant has been made and all the bolts have been tightened up, the grouting in of the bolts in the respective holes is carefully undertaken.

The holes accommodating the holding-down bolts, whether in masonry or concrete, should have rough internal surfaces in order to secure more firmly the lead or cement grout which is used for securing the bolts. Where care has not been taken to roughen such surfaces the writer has known the plant to be troublesome on account of the bolts and grouting becoming loosened after only a short period of operation.

Where it is possible to mould the bolt holes during the preparation of the foundation, the sides of the holes can be arranged to taper inwards towards the top, a procedure which will ensure that a tight bond is secured between the grout plug and the main foundation.

E. L. PARRY.

Coming Down to Earth. By En Avant

Some further thoughts on "Canvassing the Country"

THE ELECTRICAL REVIEW, with its customary progressiveness is succeeding in producing some excellent ideas week by week as to the best methods of tackling a canvass of the country, but it seems to me that any such effort must of necessity be preceded by sound preparation—not only for the canvass itself, but also to cope with the result which might be expected.

To anybody who has been interested to observe, as I have, the existing methods of and facilities for salesmanship in supply undertakings all over Great Britain, it will be very apparent that something vastly bigger in its outlook, its aims and its conception generally is called for than exists anywhere in this country. Perhaps I should except from this statement one or two private companies—more particularly in the north and west of England, which have the advantage of being managed and directed by men who have progressed in a harder, more practical, more commercial sphere than the sheltered avenue afforded by non-commercially minded municipalities to the non-commercially minded residuum of the original consulting engineers, who invariably left behind a *protégé* to run the station which he had assisted in erecting.

I would not wish to disparage the technical ability of those men, whose knowledge of the intricacies of Ohm's Law and a judicious use of manufacturers' specifications have enabled them to build bigger and better generating stations as they became necessary, but I would question the suitability of these same men to handle the intensive sales effort now called for.

A critic might at this point argue that the necessity which arose for bigger generating stations just mentioned might be construed as proof that these same men *have* developed the use of electricity, but I would say that it was the manufacturers of electrical apparatus who, by their advertising and sales efforts, combined with the obvious advantages offered by electricity, forced a demand on the supply authority which often completely upset the unimaginative programme of that authority.

Many readers probably know of such cases where consumers were clamouring to use radiators, &c., but were not permitted to do so—or only to a very limited extent, owing to inadequate generating plant or distributing mains.

It is obvious, therefore, that first and foremost we must have men of imagination at the absolute head of electrical commerce. Men capable of anticipation and realisation of the enormous field for development.

Too "Highbrow"

The situation has certainly improved somewhat during the last few years. Slowly it is being recognised that electricity represents—in terms of current-consuming apparatus—something which can be made attractive to the eye of the ordinary man in the street.

So far, so good, but it is at this point that the supply authority all too often makes a bad mistake. It builds, or acquires a "showroom and offices." Not a shop, mark you, but a showroom and offices. Many thousands of pounds are expended in equipping premises with every merit save that of enticing and welcoming customers within. Mr. Swale, in his recent excellent article in these columns, admirably sums up my views on showrooms *versus* shops when he says that we must "kill the mystery bogy."

But supposing one is willing to travel half-way across the borough and has the temerity to walk with possibly wet and muddy boots over the spotless floor of the Corporation Electricity Department's showroom and offices (foundation stone laid by Alderman ———, Chairman of the Electricity Committee). Here one may interview the showroom manager, furnish him with one's name and address and certain cash, in return for which he agrees to retire to the storeroom and prepare a 60-W lamp for you to take away. Can it be wondered at that on emerging from this electric mausoleum a feeling of awe comes over one on contemplating the treasure wrested from the Mayor and Corporation?

The picture may be slightly overdrawn, but at least it illustrates my meaning when I say "Cut out the dignified ponderous 'showroom and offices.'!" Have a shop—several small shops in preference to one large one, if the area comprises more than 40 miles of streets. Fill the windows, "close dress" them. Get away from the one iron and a spotlight swank. Put in a hundred irons. Make people stop to see if you are showing a special "job line" in irons. Everybody loves a bargain whether it is or not.

Have a spring sale—clear out the remainder of your radiator stock—there will be new models next winter! Have a winter sale. Public thought can be focused on winter evenings at home. Clear out your stagnant stock of lamp shades, lamp standards, toasters and so on. In fact, act like a shopkeeper and not as a guardian of a few rare and delicate specimens.

Do this and you will have gone a long way towards removing the impression that electricity is anything other than a useful, interesting and purchaseable commodity. There is no reason at all why every man and woman in the country should not enter an electric shop in the spirit of anticipation with which they enter a Woolworth store or Selfridge's!

Another "mystery bogy" is the vexed question of tariffs. It is not likely that it will ever be possible to have a standardised unit charge throughout the country, but a standardised *method* of charging is not too much to hope for, and if this is to be arrived at ultimately, it can only be along the lines of a pure two-rate system based on the only factors common to every supply authority in the Kingdom. Why mystify and confuse the consumer with talk of kWh, m.d., killowatts installed, floor areas, rateable values, sliding scales, rebates and other fluctuating considerations?

Simpler Tariffs Essential

As the grid scheme develops more and more so will the whole matter resolve itself into a question of load factor. There will be a peak load and an off-peak load and, as a pure matter of kVA charges it will be necessary to charge more during peak hours and less during off peak. The two-rate system sees to this and has the very great advantage of being sufficiently flexible to cope with the possibility of off-peak development producing a peak of its own, which event would call for no more drastic revision of tariffs than an adjustment of the high and low rate times.

I am well aware that older and more highly remunerated minds than mine have recently declared along rather different lines, and as this article is not intended to be a discussion of tariffs, I will content myself by emphasising the vital importance in the obtaining and retaining of satisfied consumers of having the simplest possible form of tariff.

I am not going to issue an S O S for cheaper units for the very good reason that I consider the average price for electricity in this country is already low enough and compares very favourably with prices charged in other far more electrically developed countries. If electricity has a market, then it also has a market value. In the ordinary world of commerce there is no instance of a successful business being built up on price-cutting alone. The commodity has got to be of some value in itself. So with electricity. We in the industry know its value; let us preach this aspect more and more, and then the consumer will think less and less of price.

Value not Price

Commerce is purely a question of relative values. For instance, a man can buy for 30s. a suit of clothes which meets all the conventional necessities, but he doesn't. He pays several guineas for one because the vendor is able to appeal to some responsive sense in the customer. So it was with electric light. Previous to its advent other forms of illuminant were obtainable, yet just consider the enormous voluntary rush to expend capital by property occupiers desirous of obtaining the latest and, as events proved, the best possible illuminant. Neither installations nor units were cheap in those days. Let us therefore concentrate on advertising the value of what we have to offer rather than panic into a policy of cheapening it in more senses than one.

And how shall we best advertise? We all have an immense appreciation of the efforts of E.D.A., but is this really the most advantageous method? In the hitherto almost complete absence of local effort anything was admittedly better than nothing, but I think we are agreed that progress must now be looked for from more concentrated individual effort. E.D.A. appears to have recognised this by the establishment of local E.D.A. circles with a consequent tendency towards decentralisation, but even this relies too much on the voluntary efforts of a very few enthusiasts—which is precisely what has obtained in the past with so little result.

Advertising is just a question of psychology and for this reason I doubt the ability, not only of E.D.A., but of any centralised body of men, to meet the psychological re-action of such different types as the Yorkshireman, the Irishman, the Londoner, the Welshman, and all the other mentalities to which any national scheme of Press advertising must appeal if it is to be successful. E.D.A. has a definite function to perform, but in my opinion it should function as a statistical bureau to be used by local advertising movements rather than as a direct advertiser.

An Electrical Development Commission

We have our Electricity Commissioners whose business in the past has been the control both financially and technically of the generation and distribution of electricity. Why not have our Electrical Development Commissioners who would

continue to control, as now, a Central Development Fund (contribution to which should be a condition of every supply Order), and make allocations from this fund after consideration of the need for and the proposed scheme for development in any area, in just the same way as the Electricity Commissioners have to consider the plans and necessity for any generation scheme before granting permission to raise loans?

In this way a really live area development scheme could be worked up. The country would be divided into development areas, with a development manager in charge of each, appointed by the Development Commissioners, whose duty would be to foster co-operation between all supply authorities. These commercial managers would formulate such schemes of publicity and concentrated sales drives as would most likely be effective having regard to local conditions and psychology.

A bonus award by the Development Commissioners annually to the area development manager and also the supply authorities' commercial managers (not chiefs, who are usually rewarded in other ways for increased sales of energy), to be based on the increase in units sold for *specific* purposes and not merely for a general increase in sales, should supply the necessary stimulus. The area development manager should definitely be on an adequate fixed salary basis with no suggestion of a commission, as the latter system of remuneration might easily tend to a concentration on applications easiest to work up, with the consequent neglect of others sorely in need of development.

In this development plan, just as with showrooms, let us cut out the ultra super "dignity bug." The Salvation Army's methods may be a little showy, but they put it across. I don't necessarily suggest a brass band and tambourines, but I do suggest that we make a "big noise" to herald the dawn of a new era.

There are two aspects to every question, and whilst I fully anticipate a storm of criticism, so long as critics are constructive and not merely destructive, another step will have been taken towards the prosperity which development alone can bring to the industry.

Protection from Surges

IN an article contributed to the *E.T.Z.*, Mr. E. T. Norris, M.I.E.E., F.A.I.E.E., emphasises that the criterion of the damaging effect of surges is not the occurrence of transformer breakdowns during lightning storms, but the frequency of breakdowns at any time the transformer is in service.

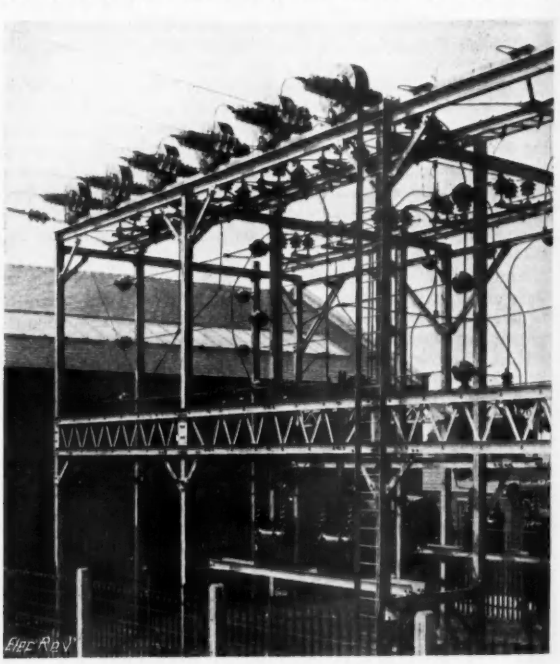
He points out that until recent years the majority of devices for the protection of electrical apparatus from high voltage surges due to lightning or switching disturbances functioned by earthing the transmission line, the operation depending essentially on the amplitude of the incoming surge. A device of this kind, giving effective protection without permitting the flow of power-frequency current, should, therefore, protect station apparatus from flashovers.

Flashovers of the station apparatus, that is, circuit breakers, transformers, isolators, &c., are, however, extremely rare. This is partly because the flashover voltage of the station insulation is always greater than that of the line insulators, and partly because the amplitude of a surge is reduced to from 35 to 65 per cent. of its incoming value by the electrostatic capacity of the circuit breakers, transformers, busbars, &c., and by the reduction in surge impedance due to the surrounding steel-work. Moreover, in European countries where the Petersen or similar type of coil is used, flashovers are rendered comparatively harmless whether occurring on line insulators or within the station. So far as the protection of electrical apparatus is concerned, therefore, the reduction in amplitude of the surge is not of the first importance.

Concentration of Stress

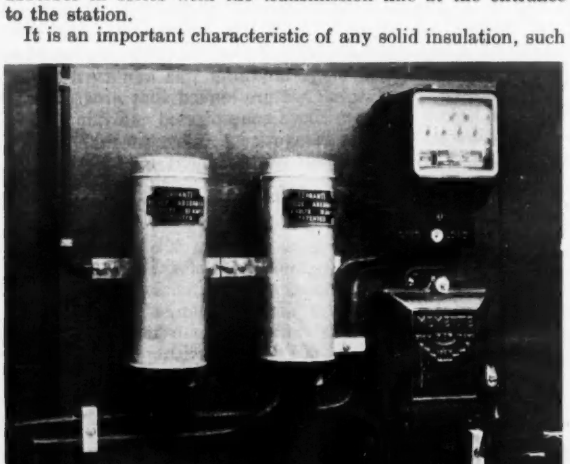
For high-voltage transmission and distribution circuits, the chief danger of surges is in damaging inductive apparatus such as transformers and rotating machinery. This danger is due to the steepness of the wave front or transient nature of the surge causing concentration of the surge stress at various points within the windings. Surge breakdowns occur, not in the major insulation between high-voltage and low-voltage windings or ground, but between turns and coils of the windings. It is, therefore, important that the protective device should be operated by the steepness of wave front or equivalent frequency of the surge, rather than by its voltage amplitude. This form of protection can be obtained by connecting a surge absorber in series with the transmission line at the entrance to the station.

It is an important characteristic of any solid insulation, such as that between turns and coils in a transformer, that the damage done to it by surges is cumulative and progressive, and, moreover, is not apparent at the time, since a power arc does not follow a surge breakdown between turns or coils of a transformer. These surge failures will be the seat of complete breakdowns if the insulation is later strained by overloads, short circuits, &c.



Surge absorbers in a 22-kV sub-station

Probably many transformer breakdowns on overload or short circuit attributed to overheating are due in the first place to damage caused by surges.



A typical house service absorber installation

Damage to Consumers' Installations

In low-voltage circuits, such as domestic installations, the chief danger from surges lies in the breakdown of electric cookers, radiators, meters, &c., damage to which is due to the voltage amplitude of the surge. Absorbers intended for such service should, therefore, be so designed as to reduce the amplitude of the surge, their effect in flattening the wave front being a minor feature.

The principle of operation is the same as in the power system absorbers previously referred to, but the technical characteristics are suitably modified so as to accentuate the reduction in voltage amplitude. The coils are of multi-layer cylindrical form with the electrostatic capacity increased relatively to the self-inductance by means of earthed metallic sheets inserted between layers of the coil.

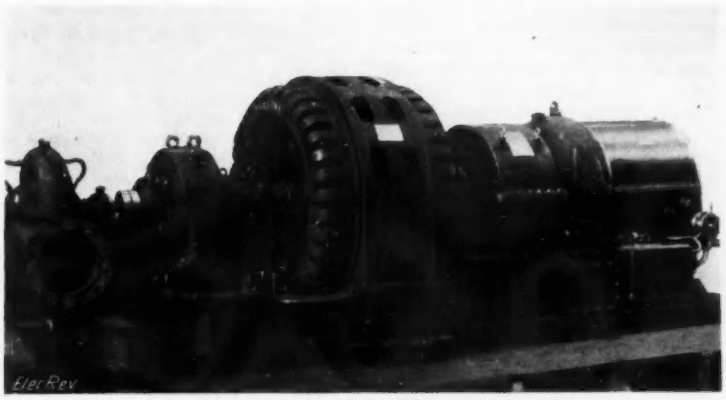
The factors contributing towards full recognition of the success and efficiency of any protective apparatus, are, first, that its theoretical principle of operation should be sound; secondly, that experimental study should confirm the theoretical deductions; and, thirdly, that operating experience should complement both theoretical calculations and experimental results. Operating experience thus far has completely fulfilled the promise of the first two factors.

"Uniplane" Turbo-Alternators

FOR small power stations and industrial plant the "Uniplane" type of steam turbo-generator has conspicuous advantages. It is compact and entirely self-contained, requiring neither basements nor condenser pits, and the cost of installation is therefore low, while operation and supervision are made easy since the whole of the machinery is on the engine-room floor.

Messrs. C. A. Parsons & Co., Ltd., were building small self-contained sets with a rectangular condenser above the floor level, which formed a bedplate for the turbo-generator, as long ago as 1896, and in the development of the present range of standard designs the chief objects have been the reduction of the capital cost of the plant, buildings, and foundations, and the attainment of such simplicity of operation that the sets could safely be left to the care of unskilled or native labour without sacrificing reliability and efficiency.

The general appearance of the "Uniplane" type of machine as now built will be gathered from the accompanying illustration, which is a view of a set of 1,250-kW capacity which has just been constructed for Benares, India. The turbine is of the impulse - reaction design, comprising one velocity - compounded stage followed by twenty-one rows of reaction blading. It runs at 6,500 r.p.m. driving the alternator, exciter, and circulating pump, all at 1,000 r.p.m through reduction gearing. The alternator is of the salient-pole open three-phase, 50-cycle, 3,300-V type.



A Parsons 1,250-kW "Uniplane" set

The condenser is situated alongside the turbine, as the illustration shows. This arrangement is particularly convenient, not only on account of the easy accessibility of the turbine and condenser thus attained, but also because it allows what is virtually waste space at the side of the alternator to be used for the withdrawal of the condenser tubes when required. Hence, when several machines are installed in the same power station, they may be set very close together, as the usual space between them for tube withdrawal is not needed.

Rigidity and compactness are enhanced by making the bedplate and the lower halves of the turbine casing and gear box in one casting. Another feature which makes for compactness is the use of single-helical reduction gear, in place of the more usual double-helical type. The diameters of both wheel and pinion are somewhat greater than for double-helical gearing of equal duty, but this is more than compensated for by the saving in length, as the centre bearing is dispensed with and, also, the face width of the gear can be reduced.

The gear teeth are cut by the Parsons' "creep" process, which is so accurate that no special torsion or quill drive is required to ensure silent and satisfactory running. It may be remarked that, up to date, Messrs. Parsons have supplied hundreds of sets of gearing, aggregating over 400,000 b.h.p., for land turbines, and, though in the early days customers occasionally were nervous and bought a spare wheel and pinion, the company has no record that they were ever used.

The end thrust of the pinion is kept within moderate limits by the choice of a suitable spiral angle for the teeth and is arranged to balance partially the thrust from the turbine shaft, the difference being taken up by the turbine thrust block. The corresponding thrust on the gear-wheel shaft is carried by thrust pads mounted on one of the bearings of the gear wheel. All bearings are provided with forced lubrication and oil is also sprayed continuously on the teeth.

Before leaving the works the set was carefully tested at four loads, with the results given in Table I. It will be noted that at every load the steam consumption was materially lower than that guaranteed. The machine indeed is remarkably efficient for so small a unit. The overall thermodynamic efficiency, calculated on the Rankine cycle for the steam conditions at the first row of blades, works out to 66.2 per cent. at normal full load and 68.4 per cent. at the maximum continuous load of 1,250 kW.

The temperature rises of the alternator and exciter were also well below the stipulated figures, and the performance of the condenser was most satisfactory. With circulating water entering at 73.7 deg. F. and a load of 1,000 kW on the machine it was possible to maintain a vacuum of 28.2 in., the heat transmission constant "K" under these conditions having the unusually good value of 717 B.th.u. per sq. ft. per deg. F. The temperature at which the condensate was withdrawn was 98.2 deg. F., or a tenth of a degree higher than that of the steam before condensation.

A further very interesting test was carried out on the complete plant with the object of determining the time required to start it and put it on load from the cold condition. The results are shown in Table II, which shows that the machine could be started from cold and put on full load in well under four minutes, without the slightest risk of damage.

Two other "Uniplane" sets of similar type and output to that described above have just been constructed by Messrs. Parsons for Lucknow. They also gave excellent results on the test-bed at all loads.

TABLE I

TESTS OF 1,250-kW "UNIPLANE" TURBO-ALTERNATOR

Nominal load .. .. kW	500	750	1000	1250
Test load	508.8	761.2	1043.2	1256.8
Test load, inc. auxiliaries	534.3	786.7	1068.7	1281.8
Duration of test .. .. min.	81.1	59.3	61.1	38.2
Steam consumption .. .. lb./hr.	8134.7	11622	14726	18062
Do., Turbine only .. .. lb./hr.	8084.7	11572	14676	18012
Stop-valve pressure .. gauge lb.	204.3	200.9	203	195.7
Stop-valve temp. .. .. deg. F.	594.7	593.5	593	507.3
Pressure below stop valve lb. abs.	115.5	162 3	205.7	189.7
Vacuum (bar = 30 in.) .. in.	28.15	27.74	27.43	26.73
Steam rate as run .. lb./kWh	15.13	14.18	13.73	14.05
Steam rate corrected to guarantee conditions	15.3	14.31	13.89	14.19
Guarantee .. .. lb./kWh	15.72	14.64	14.18	14.4
Percentage better than guarantee ..	2.67	2.25	2.0	1.46

TABLE II

QUICK-STARTING TESTS ON "UNIPLANE" TURBO-GENERATOR

Operation.	Time required from commencement of test.
Steam on cooling water ejector	20 seconds.
Steam on glands	
Steam on air ejector	
Steam on auxiliary oil pump	
Vacuum raised to 10 in. and the machine started ..	1 min. 45 sec.
Turbine up to full speed	3 min. 40 sec.
Turbine on full load	3 min. 50 sec.

Electrical Howlers

The modern schoolboy knows more about electricity and science than many grown-up people; some of his knowledge is gained at school, and some of it during his leisure hours. His knowledge is often fragmentary or even misleading, and then we get some laughable yet perfectly understandable howlers.

In Mr. Cecil Hunt's latest collection, "Howlers Encored" (Bodley Head, 1s. 6d.), are several hundred howlers, some of them having reference to electricity.

The dry facts of history held no charms for the schoolboy who penned, with his mind on more exciting topics, "Napoleon the Third won the battle of Magnets."

Did you know that a "positive is an molecule which has electrons distracted from it" and that "The farad is the unit of cowpacity"?

Here are some more new facts about electricity :—"Wireless waves travel at such a high frequency that it is impossible for the naked ear to detect them." "In charging accumulators make sure that the specific gravity absolutely covers the plates." "When the circuit oscillates it is in residence." "Wireless valves are worked by eccentricity." "A dull-emitter valve filament is coated with thorax." "Wireless is of great use to ships at sea, it helps vestals in distress to communicate with the mainland."

One would think that every boy has heard of Marconi. One boy, however, solemnly averred that "Marconi was a famous painting by Leonardo da Vinci," and it will be news to most of us that "electricity is a solid gas and liquid fuel," but there is truth crudely expressed in: "Electricity is bad for you sometimes. It gives light and dark, also shocks and death." In pre-electricity days we endured poor lights in our homes, but things were never really so bad that "rooms were once lighted by chanticleers," as one boy stated.

In a Biblical examination one young genius quite logically stated "The Parable of the Foolish Virgins shows us how much better it is to have electric light." There in brief is a fine suggestion for a perfect electrical advertisement.

C. H. LEA.

Industrial Electrification. By V. W. Dale (E.D.A.)

Selling more electricity to factories and workshops

HAVING shown in my recent article, "Cultivate the Consumer" (ELECTRICAL REVIEW, December 4th), how great is the scope for selling more electricity to existing domestic consumers, it remains to survey the commercial and industrial field. Before doing so, however, I would once more place emphasis on the fact that the inadequate installation is a very serious factor, and at the same time an indication of the market for millions of accessories and an immense amount of installation work. In this respect conditions really are bad—one is almost tempted to say deplorable. Consumers must be urged continuously and educated to install *more outlets*.

At the moment we are not really concerned with the question whether people can afford or cannot afford to extend their installations. The pertinent question is: Are we satisfied with the "*Thou shalt not*" type of installation which deliberately restricts the demand for electrical energy. Hundreds of thousands of houses and flats all over the country have been wired by some wretched builders with a miserable pendant per room taking the place of the erstwhile centre gas burner.

These unhappy people are known to us as "consumers"; they are recorded in the meter department; they receive their accounts regularly even in the summer quarters when the cost of collection often nearly equals the value of the account. It is submitted that we should cease to call them consumers and more fittingly regard them as "*prospects*"—prospects for additions to installations; for more efficient and more attractive fittings; for heating, cooking, water-heating, and labour-saving appliances; and for bigger current consumption, much of which would be entirely off-peak, entailing no capital expenditure, and very profitable even at low prices.

Space will not permit entering into details, but little imagination is required to visualise the dimensions of the business which is available for all classes of electrical manufacturers as well as for the contractor and supply undertaking, particularly where attractive tariffs and deferred-payment schemes are in operation.

The Commercial Prospect

An almost identical story might be told regarding the shopkeeper consumer. Seventy per cent. of our shops are inadequately lighted on account of the continued employment of obsolete installations and fittings. Lighting points very frequently remain exactly as and where they were ten or twenty years ago. Is it not due to inadequate selling and service organisation that nine shopkeepers out of ten do not know that the prices of electricity and lamps are very different from what they were when they first installed electricity? They should know that on account of progressive reductions in the prices of electrical energy and electric lamps and the greatly increased efficiency of lamps and fittings they can now obtain from three to six times the amount of light for the same expenditure twenty years ago.

Better lighting is unquestionably a gift to the shopkeeper compared with his other selling costs. But judging from observation, particularly along the numerically superior secondary main thoroughfares, it would appear that the majority of these people still look upon electric light as a burden and an expense, and this attitude will persist so long as electrical sales organisation omits to make adequate provision for canvassing nearly 600,000 shops which are to be found along the route of the mains of the supply undertakings.

What scope there is here for the employment of British workmen in a field in which we more than hold our own. British wires and cables; British fittings and reflectors; British accessories; British lamps; British coal and labour to supply electrical energy; and British workmen to carry out installation extensions and alterations.

A little meditation on the subject will make it clear that if the proposed national market investigation and canvass are extended to power, heating, ventilating, refrigerating and other electrical applications in business premises, volumes of potential business will be revealed.

Industry—the Vital Factor

Figuratively speaking, industrial prospects (and we are still considering existing consumers) are almost infinite. The anti-dumping measures introduced by the Government and the prospect at an early date of the application of a scientific tariff, are the electrical industry's glorious opportunity. Let us see to it that it is firmly established in the minds of our manufacturers that electricity as a drive, and employed in their various processes, means greater efficiency and greater output and all the concomitant advantages which these conditions imply.

Astute observers are beginning to suspect that out of the international industrial tangle Great Britain will emerge triumphant; may it be so. The electrical industry has a great responsibility in this matter; by "stepping on it" unfalteringly the sales branches can immeasurably assist British industries to avoid those pitfalls and disasters which have overtaken some of our great industries which failed to adopt available time- and labour-saving devices.

"More Power for the Worker" is not merely a slogan—it is internationally accepted as a vital factor in industrial efficiency, but that is only the beginning of electrical possibility. While aiming at the all-electric drive in our factories we should be unremitting in bringing every other conceivable application to the notice of manufacturers and, as the test hereunder clearly shows, it is likely that many of us fail to conceive essentially practical appliances and applications.

Some Typical Opportunities

Apart from renewing lighting; providing electric lifts; installing electric fire alarms; canteen equipment; and other applications common to all industrial establishments, consider to what extent the factories in our own areas (trades which are common to almost all districts) employ electrical methods; here are some of the deficiencies, or shall we say "opportunities"? which such an investigation and canvass would reveal, *e.g.*, electrical apparatus for:

(i) PRINTERS: LITHOGRAPHERS: BOOKBINDERS: NEWSPAPERS

Binders and formers	Matrix heaters
Branding irons	Monotype machines
Drying cabinets	Perforating machines
Embossing blocks	Stapling machines
Embossing presses	Sealing-wax heaters
Finishing irons	Soft metal furnaces
Glue pots	Solder pots
Lettering presses	Soldering irons
Cutting machines	Wrapping machines
Ruling machines	Photographic lamps
Stamping machines	Water heaters
Stitching machines	Electric delivery vans
Gumming machines	Addressing machines
Ink-drying heaters	Fans
Monotype heaters	

(ii) DYERS, CLEANERS AND LAUNDRIES

Callendar drying machines	Ironing machines
Callendar surfacing machines	Mangling machines
Carpet-cleaning machines	Ozonators
Centrifugal dryers	Pressing machines
Dye grinders	Sewing machines
Dyeing machines	Washing machines
Heaters	Water boilers
Hotplates	Dust-exhausting plant
Immersion heaters	Fans
Irons (various types)	

(iii) REPAIR GARAGES

Air compressors	Oil temper baths
Battery charging sets	Paint mixing machines
Rectifiers	Paint spraying machines
Buffing machines	Riveting machines
Grinding and polishing machines	Rivet heaters or furnaces
Conveyors	Screw-cutting machines
Cranes	Sand blast machines
Drilling machines	Saws
Emery wheels	Soldering irons
Enamelling ovens	Welding plant
Engine heaters	Vulcanisers
Annealing furnaces	Tyre pumps
Lathes	Vacuum cleaners
Machine tools	Inspection lamps

The foregoing, three out of something like three hundred trades which could be similarly treated, will, it is hoped, achieve their purpose here by stimulating interest in the vast possibilities of extending the use of electrical service in many thousands of industrial establishments which in the past have been benevolently regarded as consumers, and left at that.

In the Major Industries

If a scientific investigation were carried into the big industrial areas and applied to engineering, iron and steel, cotton, wool and textiles, footwear, paper mills, woodwork, cement and rubber, and other major trades, the writer is convinced that the record of business prospects for all sections of the industry within the organisations of existing consumers would often prove to be of such dimensions as to stagger the investigators.

Let us forestall the question which will inevitably creep into the reader's mind at this stage: the ability of industry to bear the cost? a difficult matter without doubt, but *not* an insuperable difficulty—perhaps an opportunity may occur later to deal with it. At the moment the sole object of this appeal is to establish, not in a slovenly way, but in a scientific manner, that the business is there, and that in the National Canvass lies one of the mightiest projects for development the electrical industry has ever conceived.

Prepare for the Tariffs

We should be well advised at the same time to keep a watchful eye on those new industries which it can be anticipated will be established during the next year or two.

(*Concluded at foot of next page*)

System in Contracting. By H. R. Taunton

Filing methods which will prevent confusion

IN last week's issue I showed how much time and trouble (which means expense) may be saved in a contracting business by the adoption of a thorough and accessible filing system. The following article carries the matter into a little greater detail.

Preliminary correspondence accumulated when a contract was still in the "inquiry" stage will naturally form the nucleus of the file. There is an indeterminate stage when a "firm" inquiry has been dealt with by a tender. The papers, largely consisting of trade quotations, have been lying, for weeks perhaps, on the estimator's desk, but he has now no use for them, until—if ever—the order follows. With them will be copies of final reports, specifications, schedules and estimates. The whole may be too bulky to be returned to the "inquiry" files. They are best kept loosely in temporary folders of a distinctive colour, labelled and numbered to correspond with the pagination of the permanent estimate file, which thus forms an index to them. The folders can then be stacked together in numerical order until wanted—and here a vertical filing drawer could well be used. If they never attain to the dignity of a contract file—if the order is definitely lost—they can be disposed of as described later, and the folders used again.

Copies of Estimates

The estimate file referred to is a special file, independent of the various contract files. An extra carbon copy should be made of all estimates, specifications, schedules and reports. These extra copies go to form a special record, and should be bound together in order of date and as permanently as possible. They should be numbered consecutively and a suitable index provided in the file. They should never be removed from this file—the contract copies are available for all ordinary purposes—and thus collected together they form a most valuable record. Not only are they there for reference in emergency—in case, for instance, the contract copies are lost or defaced—but they provide in the most convenient form invaluable data for future estimating.

It is not a bad plan, too, to have a similar special file for all incoming orders. This is a safeguard against possible loss or damage to what, in case of dispute, might become essential documents. Moreover, such a file, in which all orders are kept together, may be a great convenience, and at least a check, in the preparation of accounts. If this extra file is adopted, it is desirable to have a full copy of each order made for the appropriate contract file. If not a copy, certainly a slip should be filed in it, referring to the original in the order file.

Staff Letters and Reports

Interdepartmental memos, in a firm which is so organised as to make them necessary, are usually typed on tinted paper, a different tint for each department. This makes them easily recognisable and easily filed. (For the same reason, differently-tinted paper for carbons of the various sections which we have been considering will be found an advantage.) Such memos, referring to contracts, should be filed under the departmental initial, and not under that of any particular writer. Even when a firm has no particular departments, it is useful at times to put into writing some important communication to, say, the accountant or storekeeper, and these should be filed with other contract papers. Personal memoranda, sheets of calculations, and engineering notes relating to contracts, should be similarly treated, being filed under any convenient and constant initial.

Workmen's letters and reports are a form of interdepartmental correspondence, and should be dealt with in the same way; that is to say, on any one job all foremen's and charge-hands' letters should be kept together, even if different men write them at different times. If they are likely to be numerous, as on a large country job, they may be conveniently kept in a separate file with the corresponding office carbons, as above suggested.

It is desirable to issue duplicate letter-books to all charge-hands; quarto, with a ruled margin. Otherwise, they will buy their own, flimsy octavo things; or else use all sorts of odd scraps, pencilled up to the very edge and difficult to file neatly. They are apt to embody requisitions for material in their letters. Requisitions, needless to say, should be on separate forms, as they have to be dealt with by the storekeeper, and do not come into the general filing system. If a charge-hand fails to separate his requisitions from his correspondence, the necessary corrections must be made by copied extracts. A duplicate letter-book can also be used in the office for scribbling short memos to workmen or departments which are not worth typing; but the duplicates should be detachable so that they can be filed.

Guarding Against Loss

There are some points to be observed in the use of contract files if they are to be kept trouble-free. If any paper is removed from them for any other than a temporary purpose a slip giving short particulars of its contents should be filed in its place.

A corner of the Battersea electrical showrooms

Where two or more important correspondents come under the same alphabetical section of the file it is desirable to separate them by a sheet of stout tinted paper—brown paper will do. Postcards and other stiff matter should be pasted on a tough paper hinge, in which the necessary holes can be punched. If the card itself is punched, it will not only be hard to read but will interfere with the easy turning of the papers. The papers of each correspondent should, of course, be filed in order of date, the latest on top; and it is well to number each lot consecutively in coloured pencil. This is a

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* (*Continued from preceding page*)

Even in the lean years, as shown by the table below, industrial development has always merited special attention:—

Year.	Factories, warehouses, mills, offices, &c., assessed for the first time.
1924–25	17,009
1925–26	21,158
1926–27	24,828
1927–28	25,596

The prospect of industrial acceleration resulting from the introduction of a tariff should be sufficient in itself to inspire the sales section of the electrical industry to be prepared to create and meet all possible demands for industrial electric power and heat.

Apart from the value of power development to our manufacturers of generators and motors, transformers and switchgear, meters and instruments, insulating materials and various accessories, it must not be overlooked that whereas one kilowatt of plant in the station will produce about 1,800 kWh per annum under ordinary lighting conditions, with certain industrial loads one kilowatt plant produces as much as 6,000 kWh—a matter which obviously has a very important bearing upon general electrical development.

Therefore, in conclusion, the writer again urges the industry, while continuing its efforts to secure new connections as rapidly as possible, not to overlook the fact that existing consumers are not consumers only, but that in nearly every case they are important prospects and that in the premises of our present three and a half million consumers there is a vast source of potential power to develop the wealth of the industry.

check on the right order being observed and also against the unnoticed removal of a document.

Inquiries to the trade asking for quotations are usually sent to several firms, but only one carbon will be made, on which the names of the several firms will be noted. Such carbons are best kept temporarily at the back or front of the file, and when the order is eventually placed with the selected firm the original inquiry can be transferred to the section devoted to that firm's correspondence.

Blue prints and other papers not too bulky to be filed, yet larger than the standard folio, should be folded so that one edge to be punched projects beyond the other. If folded evenly before punching it will be impossible to refer to it without removal.

The bulkier matter which accumulates with every contract is more difficult to deal with. Plans and large drawings, when not actually in use, are, as has been said, a matter for the drawing-office. There remain smaller prints which, though they remain too bulky for filing, can be folded, and such items as pamphlets, bound specifications and mounted photographs. To leave them loose inside the covers of a file is only to invite trouble. The best thing to do with them is to supplement the arch file of the contract by a plain box file, unindexed, with a strong spring clip, in which they can be kept. Alternatively, they can be put in a nest of shallow drawers, each drawer labelled to correspond with the appropriate contract file.

Smaller Contract Filing

We have so far only considered contracts large enough to require one or more arch files to themselves. Ideally, all jobs, big or little, should be treated in the same way; but this would involve an impracticable bulk of comparatively expensive files. As a compromise, two or three medium-size jobs can be filed in one binder, each with its own set of alphabetical guides. This should not be overdone, however, as it may lead to the inconvenience of two people wanting to use the same file at the same time. There is, too, the increased risk of papers getting mixed.

The better way is to keep the papers of all these smaller jobs in separate manila folders. These are inexpensive and take up little room. Of the many types available one with some form of fastening—brass or flexible tags—should be selected, as avoiding loose papers. There will be no alphabetical index, but as the papers are supposedly few it will suffice if they are filed in order of date, irrespective of the correspondent. Any bulky documents connected with these small jobs, if too much for the folder, may be kept in a shallow drawer, as described above. In this case one drawer, suitably labelled, will serve for a number of small jobs, the matter relating to each being separated by some device such as a " bull-dog " clip.

There may be some jobs which involve perhaps only half a dozen papers, and it may seem a little wasteful to use a separate folder for them. It is better to do that, however, than to adopt a " miscellaneous " file for them and have the continual irritation of looking for papers in it which are actually in a folder, and *vice versa*.

Maintenance Matters

Files and folders for maintenance work are kept in exactly the same way as for contracts or jobs, the only difference being that, for any important maintenance contract which may extend over a period of years, it may be advisable to start an arch file forthwith, even though the number of papers for a time may warrant no more than a folder.

It is advisable to use differently tinted folders to distinguish different jobs: say town from country jobs, and maintenance jobs from either. Also, if the folders have not already projecting tabs at the back, they should be provided and labelled, preferably with a number. It all helps to easy recognition. Folders are best stacked horizontally on shallow shelves, the tabs staggered, if possible.

A point that continually rises in connection with contract files—arch files—is, what to do when the contract itself has been completed, paid for, and generally wound up, and the file itself has been cleared, at the end of the guarantee period, and its contents disposed of as hereunder described. There may still, however, be a trickle of correspondence for some years to come, or a definite maintenance contract may have been secured in connection with it.

In the latter case, obviously a maintenance file or folder should be opened; and any relevant papers, such as schedules of lights or diagrams of connections, transferred to it before the main file is put away. In the other case, too, it is advisable to open new folders rather than keep the old files indefinitely in use, or attempt to file these supplementary papers in any form of " general " binder. That would mean papers getting separated if more than one correspondent were involved, as is often the case. The folders suggested should be of distinctive colour, and the papers in them may be loose. For one thing, they will be few; and moreover they are to be cleared out periodically and parcelled with the old main file. Being loose, these folders should be stacked vertically in a drawer.

Summing up, it will be seen that the complete filing system consists of :—

(1) The " inquiry " files.
(2) A special " order " file: a permanent binder.
(3) A special " estimate " file: the same.
(4) Arch files and folders for all contract, job, and maintenance papers, supplemented by drawers for bulky matter.
(5) A temporary file—loose folders in a vertical drawer—for papers connected with estimates in suspense.
(6) Another for correspondence subsequent to the closing of a contract.
(7) An alphabetical arch file—or a vertical file—for administration correspondence.

Of these the only permanent ones, increasing in number as time passes, are (2), (3), and perhaps (7). The rest are in a state of flux: that is to say, the files and folders are cleared from time to time and re-used. The ultimate disposal of papers in (5) and (6) has been described above, and of those in (1) in a previous article. It only remains to consider (4).

" Wound-up " Correspondence

As soon as possible after the winding-up of a job—usually after the termination of the guarantee period—the papers referring to it should be removed from the current filing shelves. Their continued presence there is only a waste of space and a possible source of confusion. The simplest way of getting rid of them would be to leave them undisturbed in their files or folders and stack them on out-of-the-way shelves. But that is uneconomical. It involves scrapping an ever-increasing number of expensive files, to say nothing of the folders, which are no longer necessary for papers which may never be referred to again. There is no point even in leaving the alphabetical guides with them. The papers should be removed, without disturbing their order, and the files and folders put into active use again.

The now loose papers could be stored in plain box files, but this is almost as expensive as leaving them as they were. More crudely, they can be parcelled in brown paper; but this is untidy, and inconvenient when, by any chance, a reference to them is necessary. The following method is suggested as a compromise both neat and economical.

Disposal of Old Papers

On removal from their files the papers should be secured by tape, passed through the already existing punch-holes, from front to back and again from back to front; but not for the moment tied. They should be backed by two pieces of straw board cut to size and punched, and of course secured by the same tape. A sheet of stout brown paper is now cut somewhat in the shape of a Latin cross, with the top and bottom ends doubled over (for extra strength) and punched.

The top doubled end is then threaded by the ends of the tape, and the remainder of the short arm of the cross covers the back edge of the papers. The centre of the cross covers the back board, and the two side arms are folded over the top and bottom edges and part of the front board. The bottom arm is then folded over the front edge and the front board, and the doubled end of it is finally threaded by the tapes, which can now be tied in a bow. This secures the brown paper in position, and that in turn completely encloses the papers. At the same time, by untying the bow and slackening the tape, the papers are quickly accessible, while still safely bound together, loosely enough to be easily turned over. The complete package is stiff enough to stand upright, and all that remains is to label it.

Their Final Destination

The contents of the folders can be treated in the same way, but in their case the straw boards can be dispensed with and the packages stacked horizontally. Projecting tabs must be provided for labels if the backs are not wide enough. Alternatively, the contents of a number of folders can be parcelled together between straw boards, if the various lots are distinguished by, say, brown paper separators. There is not the same objection to this as there was to having them in one current binder, as it is very unlikely that the same parcel will ever be wanted by two people at the same time, however many old jobs there may be in it.

We have followed our papers now from the mail-bag and the filing basket to the dusty oblivion of an upper shelf. Pregnant once with fears and hopes, troubles and triumphs, and at times the very fortunes of those who handled them, their little day is done. Letters that once meant the difference between a writ and the Ritz now sink with every year to the level of waste paper. We may leave them to it, and their last end—the rag-and-bone man.

Photographs Tell the Story

Effective use of the camera

By J. S. SIMMONS

A STUDY of the advertisement pages of the ELECTRICAL REVIEW during the past year brings to light a most interesting fa.t—the advance which has been made in the use of photography as an aid to publicity. This increased use of photograpns is not confined to the technical Press.

This is due to three things. First, the standard of work produced by the printers—or, if you will, the improvement in printing machinery—has made it possible for the national newspapers to print wonderful photographic reproductive work. Secondly, the intensive research work which has been and still is being carried out in all branches of photography and photographic equipment manufacture has resulted in better pictures. And there has also been an improvement in the process engraver's product.

The chief value of the photograph lies in the fact that it contains a direct and instant appeal. The message it conveys is received with its full value, because it represents exactly the original subject. It is not only believed, but it maintains confidence throughout the advertisement until, or unless, it is let down by the "copy." Photographs can tell the whole story in the quickest possible time without the aid of "copy," or with but little of it, whilst "copy" usually requires an illustration to catch the eye to boost it up.

An excellent effect from a simple subject

The aim of good advertising is to tell the truth clearly without any suspicion of fake or wrapping. Immediately a reader becomes suspicious of the illustration the copy writer can write until he is blue in the face, but he won't regain lost confidence. There is no fear of lack of confidence when photographs are employed.

Striking Screen Effects

Recently, considerable effort has been made to obtain new and striking results from illustrations to be used in the national newspapers. These results have been obtained by "stunt" impressions produced by varying the usual half-tone screen, causing different effects of texture, &c., which are calculated to attract the eye to the advertisement. A greater and more permanent improvement was obtained by the use of what is known as "Newstone" blocks, this result being obtained by photographing the original copy to be reproduced on the usual screen for newsprint. From this negative a bromide enlargement is made and on this enlargement the artists can work, painting out certain portions pure white, drawing in detail and amplifying portions in black. From this retouched screen enlargement a line block is made which gives a most striking result, containing contrast and a considerable amount of detail. The result of these improvements has been that the publicity manager has been drawn towards the use of photographs in preference to the direct work of the artist.

This also tells its own story

A realistic night scene—an innocent deception

Some of our readers may have noticed with interest in the advertisement pages the photograph recently used headed "Silent Efficiency," which showed a "Henley" pillar at night illuminated by the headlights of an approaching motor car. This photograph was obtained in the studio by means of a small model of the pillar placed on a stone slab to represent the kerb and pavement. The effect of the approaching car was obtained by cutting circular holes, representing headlights, in a piece of black cardboard illuminated from behind. The result, without any retouching, gave a perfectly genuine effect.

Use of the Bizarre

Another distinct advance in photography for advertisers which is becoming popular of late is that known as "Photomontage." Various effects, grotesque, intriguing, puzzling, but in every case interesting, have been obtained by this method, which is the super-imposing of several photographs one over the other in a cunning way to give a satisfying pattern and an interesting picture.

From a technical reader's point of view the use of photographs is to be encouraged because nobody likes "seeing the works" more than an engineer, and what better method is there to show him than by means of a photograph. How much more is this the case with a reproduction in colour.

The work of colour printing has been quite considerably simplified during the last year or so owing to the efforts of a committee set up by blockmakers, printers, and inkmakers to work out a standardised set of three-colour inks. A satisfactory set of inks was ultimately obtained which it is estimated is suitable for at least 90 per

A picture which needed little "copy"

cent. of commercial colour work, and now every blockmaker in England works to the set of standard inks, with the result that a printer may have 8 or 16 sets of blocks from as many different blockmakers each proofed in the same set of tricolour inks, whereas before this standardisation it was quite possible for every blockmaker to use his own particular set of colours. Many doubts were expressed as to whether this standardisation would work satisfactorily, but a year's trial has proved that it is a success so far.

When colour photography comes into permanent use, as it will do, there will be no limit to the use made of the additional advantages to be derived from reproduction by colour photography. But the process blockmaker has a long way to go, the commercial photographer has a hard path to tread, and the printer will have to exert much energy before illustration by coloured photographic reproduction is commercially practicable.

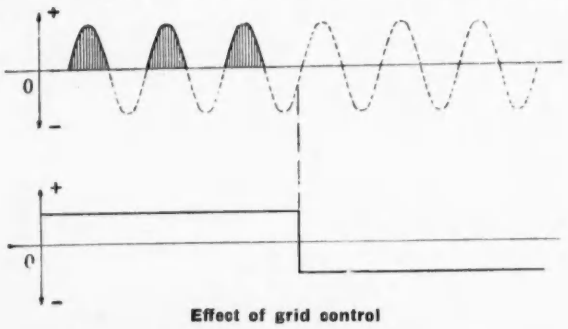
Controlled-grid Rectifiers

A means of increasing the scope of the mercury arc

THE mercury-arc rectifier is an electronic valve, the arc of which burns in a partial vacuum of mercury vapour. In this respect it differs from electronic valves with incandescent cathodes used in wireless work which require either a high vacuum or a gas content and work by grid modulation of the fundamental harmonic.

The connections of a rectifier with controlled grids are illustrated by a simplified diagram. A grid (1) is placed between, and insulated from, the anode (2) and the anode screen (3). The grid may be charged, by means of the change-over switch (5), at either polarity of the battery (4), the middle point of which is connected to the cathode of the rectifier (6). If the grid is negatively charged (instead of positively as with ordinary rectifiers), a negative space charge is produced round the grid; this acts as a brake on the electrons and prevents the arc from being ignited even during the positive half of the wave.

The effect of grid control is shown below, where the anode voltage is the upper and the grid voltage the lower diagram. The grid is first charged positively and the arc strikes at the beginning (*a*) of the first positive half-wave. A negative charge (*b*) given during this half wave cannot extinguish the arc until the end of the half-wave (*c*). If the negative charge is retained, the arc cannot strike at the beginning of the second positive half-wave, but if the grid is given a positive charge at (*d*) the arc is ignited and continues until the end of

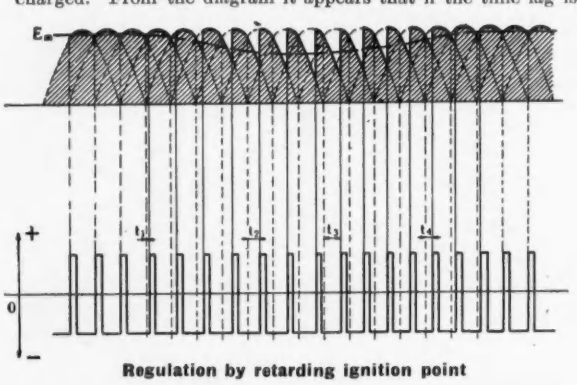


Effect of grid control

the half-wave. It is possible to strike the arc at any moment during the positive half-wave (*e*, *f*, and *g*) merely by applying a positive charge to a negatively-charged grid.

D.C. Voltage Regulation

The striking of the arc can be regulated so as to occur with a constant time lag relative to the point on the positive half-wave at which the arc would strike if the grid were not charged. From the diagram it appears that if the time lag is



Regulation by retarding ignition point

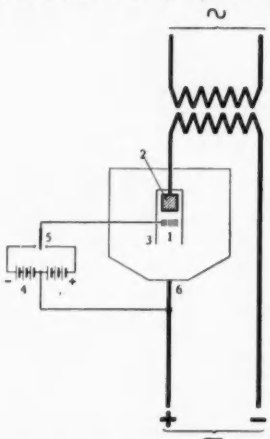
varied, the effective mean value of the d.c. voltage is similarly varied. The time lag is adjusted by means of a contact maker rotating at the same speed as the field of the a.c. system feeding the rectifier. In practice the undulations in the d.c. voltage are smoothed out by transformer resistance and by the aid of a resonance circuit. Transformer tap switches or induction regulators are thus unnecessary.

A quick-acting overload relay cuts off the periodic positive charge in the event of a back-fire in the rectifier or a short-circuit on the d.c. system, the negative charge on the grids ensuring clearance within the cycle.

Frequency Changing

To convert 3-phase to single-phase current at a different frequency, a certain number of the half-waves of the primary frequency are rectified as when converting from a.c. to d.c., the new half-waves having a length which is a multiple of the primary half-wave length. If the primary supply is 3-phase at 50 cycles and the secondary single-phase at 16⅔ cycles, the half-waves are obtained from a 6-phase secondary winding of a transformer whose primary is connected to the 50-cycle supply. The six positive half-waves form a new half-wave with a length three times that of the 3-phase, *i.e.*, 16⅔ cycles. A second 6-phase secondary winding gives the negative half-wave; this winding is connected to another six anodes.

The positive and negative polarities of the half-waves are obtained from a single-phase transformer, the middle point of which is connected to a common cathode. Current flows through winding a' or b' from the centre point according to whether the grid control lets current flow through the left- or right-hand anodes, respectively, thus changing the polarity of each six consecutive half-waves at 16⅔ cycles. Several means of ensuring that the secondary voltage is sinusoidal can be adopted. The contact maker is driven by a synchronous 3-phase motor. Elastic coupling between 3-phase and 1-phase systems of different frequencies can also be obtained. The motor driving a modified contact member can be driven from the single-phase system, and current flows through the anodes according to the requisite length of the secondary half-wave instead of according to the 3-phase polarity. A variable slip between the two frequencies is obtained.

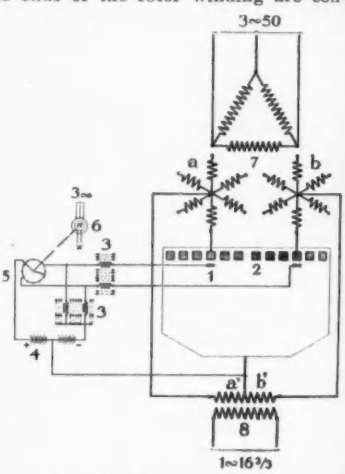


Simplified diagram of grid control

Single-phase Motors without Commutators

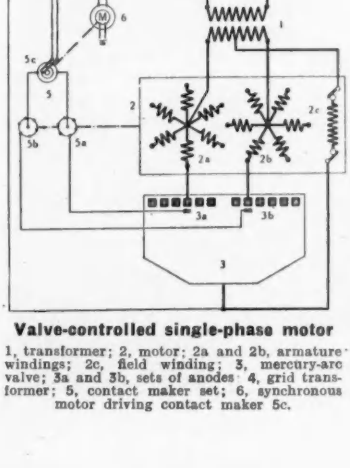
Single-phase motors without commutators can be connected through mercury-arc valves to either a single-phase or one phase of a 3-phase supply, as indicated at the bottom of this page. The stator has two 3-phase windings whose middle points are connected to the ends of the secondary winding of a single-phase transformer. The ends of the rotor winding are connected through slip rings to the middle point of this secondary winding and to the cathode of a mercury-arc valve.

The valve contains two sets of anodes connected to the phases of the two stator windings. A contact maker allows current to pass alternatively through one or other of the sets of anodes, at the same time connecting the rotor winding in series with the stator winding through which current is flowing. The motor has a series characteristic. Its terminal voltage can be varied by altering the setting of the contact maker, enabling its speed to be varied independently of the supply voltage or frequency.



Frequency-changer circuit

1, grid; 2, anodes; 3, grid resistances; 4, source of d.c.; 5, contact maker; 6, synchronous motor for contact maker; 7, transformer with two 6-phase secondary windings; 8, single-phase transformer.



Valve-controlled single-phase motor

1, transformer; 2, motor; 2a and 2b, armature windings; 2c, field winding; 3, mercury-arc valve; 3a and 3b, sets of anodes; 4, grid transformer; 5, contact maker set; 6, synchronous motor driving contact maker 5c.

D.c. to a.c. conversion may be brought about by methods somewhat similar to those used in the case of the commutatorless motor.

Another possible use for the controlled-grid rectifier is for the transmission over great distances of high-voltage d.c. power that has been generated as 3-phase alternating current. The information contained in this article is based upon tests on these rectifiers carried out by Messrs. Bruce Peebles & Co., Ltd., at the works of Messrs. Brown, Boveri & Co., Baden, Switzerland.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

The Law of Employer and Employé

LECTURING last week on "The Legal Position Governing the Employment Conditions of Supervising Engineers" at the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS, Mr. C. Nyholm-Shawcross explained that three kinds of law are administered by the courts.

Common law means ancient customs. Statute law is mostly modern; a statute is supreme and may completely alter custom, or common law. For instance, if a man is killed whilst at work by the negligence of his employer, the Fatal Accidents Act, 1846, enables his dependants to inherit his right to compensation. The law of equity is the third kind, a set of rules framed to mitigate unfairness due to the inflexibility and technicality of common law.

The conditions of employment are affected by agreements, or contracts, or by torts (the legal term for a wrong, which, in law, gives the injured party a right of redress against the wrongdoer). To break a contract may be a wrong, but it is not necessarily a tort. Often the same wrong is both a breach of contract and a tort, and may even be a crime as well. Writing is only necessary when the employment is to last longer than one year. The important rule is that when there is a written contract, the writing must contain all the terms of the contract. Any terms left out of the writing will not be enforceable, but there are many exceptions to this rule; one is when there is a custom in a particular trade or profession.

The same rules of law are applicable to all classes, but one particular employer is a class by itself. The Crown employs its servants at pleasure, and can always dismiss them without notice, and for any reason it chooses, or no reason at all. A statute, called the Public Health Act, has provided that a similar rule shall apply to urban district councils as to the Crown. That is another instance of the alteration by statute of the common law.

The relationship of master and servant exists whenever the employer has, by his contract, the power to tell the employé not only what he is to do, but how, when, and where he is to do it. The other relationship is that of "independent contractors," who are persons like a doctor, a solicitor, a consulting engineer, an architect, and so forth. The position of such persons is, from the legal point of view, not generally so happy as that of people in employment.

SERVICE AGREEMENTS

Some professions have standard forms of agreement—a system which has many advantages; for example, in a comparatively young profession in which no legally recognised customs have yet matured.

If the time clause is left out, the law says that the agreement is for one year. The next important clause deals with notice. If that is left out, then if the contract is a yearly one, it can only be terminated at the end of the year. Otherwise length of notice depends upon any custom, failing which it must be reasonable as decided by the Court in each particular case.

The "restrictive covenant" is a clause which provides that, after the termination of an agreement, one's freedom to accept other employment is to some degree curtailed. The rule is that an agreement which only partially restrains trade is allowed, but one which generally prohibits a person from carrying on his trade is void. The test always is: Is the restriction reasonable?

If there is a restrictive clause which the Court considers is more severe than is reasonably necessary for the protection of the employer, it sometimes decides to split up the different provisions of that clause, and it will enforce that part of it which it deems reasonable, and refuse to enforce the other. Restrictive clauses include not only those which forbid an employé to set up in business in rivalry to a former employer, but also to those in which the employé agrees not to interfere with, or solicit, the business of his former employer's customers.

A peculiarity of this kind of clause is that it remains binding after the rest of the contract of which it forms a part has been terminated only if the main contract is terminated properly. For example, if an employer wrongfully dismisses a man from his service and repudiates the whole contract, he cannot afterwards prevent that man from setting up a rival concern on the opposite side of the road, whatever the contract may say; but if the employé wrongfully terminates the agreement, the restrictive clause remains binding upon him.

The burden is upon the employer to show that the restriction is reasonably necessary for his protection, because of the old rule that every covenant in restraint of trade in unlawful.

RESPONSIBILITY FOR INJURY

When one accepts employment one accepts the risk of injury that may arise from the negligence of another employé, or from defective premises and machinery, although one can still claim against the employer if it can be proved that he himself knowingly or negligently created the danger. Thus where dangerous machinery is used, the employer must see to it that his employés are properly instructed how to use it.

But suppose the employer had fully instructed the workman? Then when two men employed by the same employer are engaged in the same or a similar kind of employment, if one of them sustains injuries as a result of the negligent conduct of the other, he cannot make the employer liable for the damage caused by the injuries. They must be employed by the same employer, otherwise this defence of "common employment" would not arise.

Another defence of a somewhat similar kind is that of "*Volenti non fit injuria*," which means that to one who willingly runs the risk there can be no right to recover damages. It is not enough merely to know of the danger, one must be willing to run its risk. Thus, if one had repeatedly protested against the stupidity of allowing an unskilled man to work on electrical plant, although one had continued to work with him, one would be doing so knowingly, but not willingly There must be both knowledge and a willing acceptance of the risk to establish this special defence.

Finally, one other kind of special defence is "contributory negligence," which means that when an accident occurs as a result of some negligence of the employers (including the negligence of his servants in cases where he is responsible for that) the injured party cannot recover damages if it can be shown that he, too, was negligent.

Statutes have been passed which impose an absolute duty on employers to take various specified precautions to make machinery safe. The regulations must be observed, however stupid or unnecessary they may seem.

Other statutes affect an employer's liability for accidents. The Employers' Liability Act takes away the defence of common employment in certain specified cases, and enables the widow or children to recover a sum equal to the man's average earnings over three years. Notice of the accident must be given within six weeks, and an action commenced within six months. The Workmen's Compensation Act imposes an absolute liability on employers. and allows a larger class of dependants to recover compensation.

In certain cases, if an employer is forced to pay damages to some third party for his employé's negligence, the latter may be liable to repay those damages to his employer. On the other hand, if the employer orders him to do some act for which he is made responsible by a third party, he may be able to recover from his employer the damages which he is forced to pay.

Ferranti transformers at a Sun Yat Sen memorial in China (*see* p. 970)

Displacement or Retention ?

THE tenth annual dinner of the West Wales Section of the ELECTRICAL POWER ENGINEERS' ASSOCIATION was held on December 19th at Swansea. The Chairman of the Section (Mr. H. O. Davies) presided and was supported by Mr. J. W. Burr, borough electrical engineer, Swansea, Mr. E. Jones, chairman of the Cardiff branch, Mr. G. H. Thompson, borough electrical engineer, Neath, Mr. D. Farr Davies (president-elect, Association of Mining Electrical Engineers), Mr. O. Hosgood, Carmarthen, Mr. D. E. Morris, Tenby, Mr. A. L. Cockburn, Llanelly, Mr. A. Parkinson, Bristol, Coun. M. Hughes (vice-chairman, Swansea Electricity Committee), Mr. A. Rees, chief assistant engineer, Swansea, and others.

The toast of "The Association" was given by Mr. Burr, who said that the 1926 Act had altered things very much and the shutting down of the majority of the smaller generating stations would mean the throwing on to the industrial market of many men who had only been accustomed to power station work. He suggested the Association should look after those men and so he was glad to hear from the chairman that the Association had started classes so that they might fit themselves for other branches of the industry.

He did not wish to be misunderstood. There would be plenty of vacancies in the electrical industry, for though there had been an ebb and flow, yet he could not recall a period in its history when there was a real set-back. In spite of the general trade depression the electrical industry was one that would expand more in the future than in the past.

Attempts had been made to reduce salaries, but those who had agitated for it had overlooked the fact that under the cost of living scale of the National Joint Board the profession had already suffered a reduction of 17½ per cent., which would bear comparison with any reduction by any other government or municipal department.

Mr. E. Jones, Cardiff, responded and Coun. M. Hughes proposing "The Electricity Supply Industry," said it was very gratifying for Swansea to know that the new super station that was being erected meant that they would share in the future achievements of the industry which he believed had a sufficient future to retain the large number of men employed in it despite the closing down of the smaller stations.

They were looking forward to the time when electricity in homes would be as necessary as the water supply, and he hoped that the new super station at Swansea would be a credit to the town and a model to the electrical industry.

Mr. Thompson (Neath) congratulated Neath as well Swansea on the fact that the new super station was to be in Swansea, because the nearer it was to any district the surer and the better would be the supply. He complained, however, of the laxity of the 1926 Act which permitted private plant to supply energy which should come from the grid.

Mr. D. Farr Davies, responding, pointed out that private plant owners must take care of themselves, and said that it should be remembered that before there was any talk of an electricity supply they were supplying energy to industry.

Thunderstorms and Overhead Lines

THERE was a long and detailed discussion on the effects of lightning and surges on overhead lines at a meeting of the OVERHEAD LINES ASSOCIATION in London on December 16th.

Mr. G. Molle (hon. secretary) gave details of a census compiled by Mr. Maurice Bower, of Huddersfield, which started in 1915 and was completed in 1929. An analysis of the statistics revealed that there were roughly forty thunderstorms per annum in England and Wales and about half as many in Scotland during that period. It appeared that there was a sort of regular periodicity of storms in thirty-day waves with the maximum on the fourteenth and the minimum on the twenty-ninth of the month.

Mr. R. O. Kapp explained that a surge represented energy, and neither self-induction nor capacity could absorb energy. On most long-distance transmission systems the switches, once closed, remained closed for a long while, and it was only under very exceptional circumstances that switching might produce a surge. Therefore no money should be spent on guarding against it; England was exceptionally free from thunderstorms and therefore the case for taking special measures to guard against surges due to lightning was very much less strong in this country than in others.

The only recent experience he had had of damage due to a lightning surge was on a line from which the earth wire had been removed temporarily. The damage done was the shattering of a transformer bushing. Surges were not a very serious bogy in this country.

OPERATING DATA AND EXPERIENCE

Mr. E. T. Norris said that a few years ago the United States Bureau of Standards attempted to collect information, and in the case of 241 undertakings (in America) the instances of damage per 100 miles of line per year averaged 2.82. A very large supply undertaking in this country had similarly analysed its experience of overhead lines for the last twelve or thirteen years, and the number of instances averaged 0.82.

Operating experience showed that all trouble with inductive apparatus was due to stresses between the turns and between coils; those stresses were not due to the amplitude of the surge, but to the wave-front steepness, and the absorption type of protective apparatus operated on that principle.

Mr. A. L. Stanton said he was convinced that no one living could really say what exactly would happen under any given set of circumstances, because lightning rarely occurred in the way one expected it to happen. The more exposed the country and the higher the conductors, the more liable they were to surges; the higher the voltage the less was the liability to lightning damage.

Major T. Rich said that the French Government was seeking the co-operation of the various geological, meteorological, and other scientific societies in carrying out a census all over France. So serious had the danger been in France that in areas which had proved to be particularly dangerous special precautions were now exercised when taking supplies into houses.

REPEATED SURGES

Mr. R. W. Smart stated that a test had been made in his firm's works this year on a standard 11-kV transformer on a transmission line which was able to give a surge of 230 kV. The transformer broke down on the third surge and it was certain that there had been partial damage on the first and second surges. Nevertheless it was not apparent from its working or from the outside.

When thus partially damaged it would break down completely when it met abnormal conditions, such as an overload. From this point of view protection became very much more important.

Mr. C. O. Milton suggested it was not safe to assume that cable systems were immune from lightning trouble. A case in point was that of the lead sheathing of a cable which, during a thunderstorm, was blown clean through the armouring and re-formed on the outside for a distance of about 70 ft. Another case was that of a church, which was not damaged at all outside, but the whole of the internal wiring, which was drawn into steel tubing, was blown off the walls, and was found hanging down in strings.

Mr. J. Swan, the president, said that in his own particular case there was no lightning protection at all and there was no continuous earth wire. Circuits were continually giving out every time there was a storm, but the only damage done was to blow the transformer fuses, which were quickly replaced. After what Mr. Smart had said, however, he was a little perturbed.

Gramophone and Pick-up Design

CERTAIN of the more important considerations in the design of gramophone pick-ups are dealt with in the paper which Mr. W. D. Oliphant read before the London Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS on December 18th.

The constant-velocity system of recording is outlined, but it is shown to be necessary to deviate from this law at the lower frequencies; the h.f. limit is defined by the curvature of the needle point and undulation. The single-acting and differential armature types of pick-up are described and their relative merits commented upon.

Next comes frequency response, the standard method of obtaining the v.f. characteristic being outlined and the results analysed. Variation of output across the surface of a record is alluded to, and certain small irregularities over and above the more pronounced resonance points are explained. A warning is given as to the validity of assuming a constant wave-form throughout the tests, and a detailed account of amplitude response is given. The various resonances and the effects of constructional details thereon are referred to.

Special attention is given to wave-form reproduction, a subject that has received hardly any attention, although in the I.R.E. standard definition of pick-up the word "wave-form" is all important. This section is confined wholly to theory.

Two of the more important mechanical considerations are record wear and needle scratch. The difficulties of measuring the former and methods of minimising the latter are discussed.

Economics of Electric Traffic Control

At a recent informal meeting of the INSTITUTION OF CIVIL ENGINEERS "Road Traffic Signalling" was discussed.

Major H. E. Aldington spoke of the importance of extending electric automatic signalling on highways, if for no other reason than that of expediting the movement of traffic, and also for reasons of economy. In the London traffic area alone £450,000 is spent each year on the provision of police officers to regulate traffic at points of intersection, and he indicated how the provision of facilities for roundabout working and/or electric signalling would be an advantage to the travelling public, and would, in his view, materially reduce the number of accidents.

Mr. E. B. Hugh-Jones followed with a very full exposition of the installation of electric signals in Oxford Street, and described the mechanism and the method of control. Other speakers dealt with the question of the cycle of the lights, one or two desiring that the amber light should be considered a signal for pedestrians.

Members inspected a model of a system for the automatic control of signals at points of intersection, the signals being operated by the traffic itself.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

The Central Board and the Industry

I have read with very great interest your leading article, the article by "Protonius," the correspondence, and particularly the able letter from Mr. G. R. Smith, hon. secretary of the Electricity Supply Commercial Association.

The subject matter is evidently creating a healthy and increasing enthusiasm. With reference to the title of your leader "Who can do it best?" the writer takes this opportunity of repeating the old, old saying, "The cobbler to his last." I am in entire agreement with the comment in your editorial, namely, that there are available plenty of men who could make a marked impression on electricity consumption in a very short space of time.

I do not agree with "Protonius" that public ownership is not to blame, for to my mind it is the one snag in the business, and if supply under local authorities was carried out on the same independent lines as those adopted by many supply companies this important matter would probably have not appeared in your columns, because there would not then have been the necessity for this urgent appeal.

Supply companies are doing all that is possible with regard to publicity by Press advertising, showrooms, exhibitions, direct canvassing, &c. Their efforts in this direction merit the greatest admiration.

It is not the fault of the officials that the publicly owned undertaking is not exploited in the same progressive manner as a company undertaking. There are many difficulties in the way of intensive exploitation of the supply under public ownership—too many to enumerate. There are a few municipalities who are dealing with the matter in a most efficient and up-to-date manner, but this does not by any means apply to the great majority.

I agree with "Commercial" and also Mr. Smith that if the Central Board was to step in and take full control of municipal supplies, lock, stock and barrel, the problem undoubtedly would be solved. Until this is done municipal supplies will be the one drawback in the greater expansion of the industry.

The Central Board has taken over the generating side of the industry, then why should it not take over the sales side so far as local authorities are concerned? One advantage, among many, would be centralisation and another would be the settlement of that vexed problem "tariffs." The Board could legalise universal tariffs for all the different classes of supply as it is a fundamental fact that the selling price of any commodity is that which it will fetch in the open market—in our case domestic, industrial and other supplies of a special nature.

I therefore suggest that the Board be approached and I think that the right channel of approach would be the Electrical Development Association.

In conclusion I agree with Mr. G. R. Smith that it would be to the advantage of the municipal commercial staffs to combine with the company men in one organisation which would undoubtedly be to the benefit of the industry at large.

PROTECTION.

December 19th, 1931.

The Electrical Heating of Buildings

If the communication of "J. M." printed in your issue of December 18th is ignored by me it may lead your readers to think that I intentionally misled those who attended the meeting to which he refers. May I ask you, therefore, to be good enough to publish the original note in my MS?

"Messrs. Jaros & Baum, consulting engineers, of New York, in a lengthy report on the British Embassy at Washington (designed by Sir Edward Lutyens) state: 'It seems evident that the (low-temperature ceiling-panel) heating system of the Embassy proper did not consume more than 20,000 gallons of oil. Had the Embassy been steam heated (as is usual in American buildings) they calculate its approximate fuel requirements in the neighbourhood of 33,000 gallons, so that apparently it was *comfortably heated* with a fuel consumption of only 60 per cent. of what would have been required for a high-grade steam heating system.' (*The Builder*, November 13th, 1931.)"

Regarding your correspondent's effort to introduce the proverbial "red herring" in his reference to 70 deg. F. and 60 deg. F., may I refer your readers to the following words which appear on page 1079 of my I.E.E. paper, "The Electrical Heating of Buildings," Vol. LXIX, No. 417, September, 1931:—

"The object of electrical heating engineers is not to pour heat units into a building or a room, but conversely to make such provision as may be necessary to prevent the occupants experiencing that sense of discomfort usually associated with the period of the year commonly known as 'the heating season,' and obviously the efficiency of the heating equipment is a vital factor in the calculation."

If your correspondent's innuendo is accepted, it seems to mean (*a*) that the consulting engineers employed were not competent to deal with the subject regarding which they had been retained to report, and (*b*) that the Ambassador, the members of his household and staff, and his American guests shivered in discomfort.

The comfort problem is not one of heating the normal healthy person, as the ordinary processes of digestion, &c., require an actual heat *emission* from the person at an average rate of 100 watt-hours per person per hour. Conversely, the problem is *to prevent undue loss of heat from the person by radiation, convection, and conduction.*

Data collected to date shows that for the purpose of maintaining conditions of comfort in residences, office buildings, and the like, the low-temperature radiant-ceiling panel method is as much in advance of the older convection methods (pipes, cast-iron radiators, &c.), as regards operating costs and conditions of comfort, as the modern turbine is in advance of the reciprocating engine. I quoted the report of Messrs. Jaros and Baum at the meeting referred to, as I considered it to be an authoritative comparison of the older convection method as opposed to the more modern low-temperature radiant-ceiling panel system.

Regarding your correspondent's point of electricity *versus* oil and water, as is almost invariably the case, on capital costs the electrical installation method is easily the lowest. On running costs, with current at 24 kWh per shilling during the day, and 30, or more, kWh per shilling during the night and week-end, millions of kWh can be sold for space heating, as the following simple calculation will show (higher prices will merely retard, but cannot prevent development).

Suppose that 500 undertakings each decide to have 500 rooms electrically warmed, under the thermostatic control, by Christmas, 1933—500 buildings of one room, or 250 buildings of two rooms, or 100 buildings of five rooms—making 250,000 electrically warmed rooms under thermostatic control. Assume the average consumption to be 2,000 kWh per room per annum, then the total is 500,000,000 kWh. With this "shop window" effort we can prove to our friends that continuous electrical heating, *under thermostatic control to the individual room*, is a commercial proposition, and then we can commence the real work of building up the electrical heating load which will eventually begin to warm "The Grid."

I have received permission from Messrs. Mitchell & Bridgwater, A.A.R.I.B.A., the well-known architects, to reprint the following extract from their letter of December 16th:—

"It may interest you to know that although the new St. Swithin's School is approximately twice the size of the old one, and is in a very exposed position as against a very sheltered one, records show that if they ran their new (oil-fired, thermostatically controlled, low-temperature hot-water ceiling-panel) heating plant for nine months in the year, they would still barely come up to the cost of the fuel required to heat their old building which was equipped with a coke-fired boiler, hot-water pipes, and hot-water 'radiators' or convectors.

Evidence of this nature is accumulating daily, and it behoves the keen electrical engineer to commence where our rivals have left off.

R. GRIERSON.

Technical Advisor, Dulrae Manufacturing Co., Ltd.

London, W.C.1, *December 18th*, 1931.

Diesel-Electric or All-Electric

Most of your readers will agree with your comments upon Mr. Harris's article on the Diesel-electric locomotive in your issue of December 11th. The general opinion of the electrical industry is certainly that straight electrification is the best solution of the railway problem as a whole.

Superficially this may appear to be a biased opinion, but in fact any bias which the industry might have is likely to be in favour of the Diesel-electric solution, since, if it is adopted generally, it will involve a larger expenditure on purely electrical material. The true concern of the industry is, however, to find the most efficient solution, and it is on this ground that the industry is looking forward to the electrification of busy main and suburban lines and to the ancillary use of Diesel-electric units on light branch lines and in shunting yards.

In dealing with a problem of such magnitude and complexity it is important that the industry should present a united front. Unanimity is difficult, however, when the advocates of Diesel-electric traction suggest that their system is superior to electrification for almost all classes of traffic.

Mr. Harris, for example, while admitting that very large generating sets would be required on Diesel-electric trains to cope with the power required for acceleration alone, adds that "this is not necessary on main lines." Here he seems to imply that a Diesel-electric locomotive can give as good a performance in main-line service as an electric locomotive drawing power from a central source. Such an implication, of course, will not bear a moment's examination.

What is clearly needed in this field is a frank recognition of the principle that both electrification and oil-electrification have a well-defined place in the reform of railway transport and that the progress of both systems will be retarded if their complementary character is obscured by vague or excessive claims.

ADAM GOWANS WHYTE.

London, W.C.2, *December 16th*, 1931.

Vacancies and Salaries

Recent vacancies which have been advertised in your columns for executive engineers are very interesting from two points of view: one is that most of them are of interest in the job themselves, which is the type of job the keen younger man has been waiting to come his way for some time, the other point is the advertised salaries accompanying these appointments, and in far too many of them the meagreness of that sum per annum. In the latter case, I am not at all sure just how much these low salaries reflect the psychology of the chief engineers concerned and/or how much that of the controlling councillors or directors.

We have had a mains superintendent for a young grid scheme in a neighbouring island who must be a fully qualified engineer for £450 per annum, and recently a chief engineer at £350 per annum. Could a doctor be obtained for such a sum? I think not.

I am fully aware of the fact that lay people will always under-pay engineers if they can and, as the market is at the moment, no doubt these jobs could be filled at £250 per annum and possibly quite satisfactorily from the layman's point of view. Theirs, perhaps, is just ignorance, but cannot apply to the highly paid chief engineer on whose advice the job is advertised and usually salaried.

Most younger men have to thank at least one of their professional elders for some portion of their advancement, but in the majority of cases the elders seem devoid of any sense of responsibility to their juniors. Again, the indifferent attitude of the I.E.E. towards the salaries of its corporate members is in keeping with the outlook of the rest of our seniors.

Our greybeards have spoken privately if not publicly on the unfortunate lack of status of our profession, but does the same spirit prevail when they consider advertising for a fully qualified chartered engineer? It may be said that the status of a job is not measured in £ s. d.; in some spheres of activity this may be so, but in the commercial life with which we are concerned it is the only method of reward, and, therefore, the two go hand in hand. In any case, all members should hang together and let the whittling down of salaries be left to our lay employers. Now, therefore, dear greybeards, make the New Year's resolution—"Pay well and keep 'em."

BLACKBEARD.

December 19th, 1931.

Electric Clocks

I note a letter under the above heading in your issue of December 11th, and would say that my experience of these clocks in large hotels is that they are far less trouble than those driven by clockwork. I am speaking chiefly for those operated from the a.c. mains, some hundreds of which I have under my control.

The change from summer to winter time was carried out more easily than if they had been clockwork driven, and in the very rare event of current failure it is not very difficult to re-start the clocks, especially if they are installed at a convenient height.

CHIEF ENGINEER.

London, S.W.1, *December 17th*, 1931.

With most of Mr. S. F. Philpott's "summing up" we fully agree, but we venture to think that he has overlooked two very important fields of usefulness for the synchronous clock, that is, in connection with public clocks and with street-lighting time switches, respectively.

As regards the former, it is obviously seldom possible to connect any number of clocks to a common master clock on the impulse system, so that the majority are still spring or weight operated, and suffer from the well-known vagaries of such types. The synchronous clock, on the other hand, rigidly interlocks all the public clocks in a city not only with each other, but indirectly with Greenwich Observatory.

The advantages presented by the self-starting synchronous motor for driving street-lighting time switches are of quite another kind. Great accuracy of time-keeping is unnecessary, but a cumulative error is fatal, and what is even more important is the saving of the cost of winding. The electrically wound time switch does not get over this latter difficulty, owing first to its cumulative errors, but even more to the rapidly changing times of sunset and sunrise—as much as a quarter of an hour in a week during September.

So long as it is necessary to set the clocks weekly, there is no real saving in the elimination of the winding. The synchronous motor-driven time switch, if provided with a solar correction, will switch on and off at any desired number of minutes before or after sunset and sunrise, from January to December, without any attention whatever.

EVERETT, EDGCUMBE & CO., LTD.

London, S.W.1, *December 19th*, 1931

The Consumer's Point of View

So much has been said and written with regard to selling electricity by those intimately connected with it, that words from a mere purchaser might appear cheek. Much of what has been said is sound business, but some has been the reverse, because the subject has been viewed from the seller's point of view only. One of the best expositions on this point was the article in your issue of December 4th by Mr. W. E. Swales, but I am afraid that this was too idealistic for the supply people.

Two of the greatest drawbacks to a more rapid advance of electricity from the domestic point of view, are complicated tariffs, and lack of "push" with supply authorities. Such terms as "all in," "flat rate," "maximum demand," and similar high-flown expressions, do more to put people off using electricity than is imagined, gas is so much per therm for all purposes, and you know where you are.

There is really no need for it. We are "blinded with science" on being told it is all a matter of "peak loads" and what not, but, I have yet to hear, or read, any convincing argument as to why electricity cannot be supplied at so much per unit for any domestic purpose.

It is of course understood that a too rapid expansion of the use of electricity might mean that existing plant would be inadequate to meet the demand, and it would be a pity to sink more capital in a rather slow revenue earning concern; also, the gas revenue might drop, and the two interests are not always segregated.

As common purchasers we quite appreciate these difficulties, but find it hard to see where there is any difference between them and the case of other concerns in business for profit. Perhaps when supply is given in bulk from a super station of the future, the purveyors of electricity will apply their minds to this thorny question.

The lack of "push" in selling is perhaps bound up with the previous point, the supply authorities not wishing to raise false hopes. I have now used electricity for lighting, with an iron and bowl fire, for some eleven years, but not once during that period have I been asked to consider a cooker, nor has anyone even inquired whether I have an iron. Consequently I have a gas cooker and wash-boiler, and they are more efficient, judging from the experience of friends who have been electrically equipped. I will admit cost also enters into it. Unfortunately I do not live in a cheap "electrical" district, and a few years ago you could not get an electric cooker on extended purchase terms, nor a wash-boiler, or even hire them, and even now this is limited to a few enterprising concerns and municipalities.

With my gas bill I often get a leaflet displaying some form of gas domestic utility article, but it is just "not done" by the electrical people; if you want to know anything about electrical matters you must attend the sanctum of the mighty, cap in hand, and state your requirements.

Another drawback to the more rapid advancement in the use of electricity has been, and still is, the numerous different systems of supply. The post-war population has tended to "shift houses" more than pre-war mainly for economic reasons, and I have found from experience that it does not pay to buy too many electrical gadgets; they are probably of no use if you move.

National canvassing will be a waste of effort and money; electricity does not need a national canvass, its advantages are too apparent. It is its distribution that requires a national overhauling, and a canvass within its own house would not be inopportune.

December 15th, 1931. ISA.

Winding Coils for Radio

Your correspondent, Mr. G. Jones, in your issue of December 11th, seeks for information relative to the manufacture of a particular form of winding, and to its advantages over other forms. These are questions to which a reply is impossible, for of the thousands of purposes for which coils are used (and radio calls for coils to meet numerous requirements), the method of construction and treatment must be considered to suit the circumstances of each individual case.

Both general design and choice of method are largely influenced by the degree of skill available for manufacture; what is possible by a method adopted in one factory is impossible in another for this reason. There is no golden rule of application generally. Modern coil construction has developed with scores of different types, and the industry has become one of the most highly specialised.

If manufacturers, as many do, were to seek the experience and skill of experts rather than rely on old-fashioned, rough-and-ready methods, the prestige of the radio industry would stand on a still higher level.

THE VARLEY MAGNET COMPANY.
H. Denton, *Managing Director.*

Woolwich, *December 16th*, 1931.

How to Improve Domestic Apparatus

The report of the informal discussion on this subject at the I.E.E., published on page 919 of your issue of December 18th, makes me say that I agreed with the replacement of most terminals by porcelain connectors. I certainly did not express such an opinion, as this is quite contrary to my views. A more correct summary of my remarks would be—"Mr. F. C. Raphael said there was very little wrong with apparatus for which a fair price was paid, but suggested that every part of the connectors used on electric irons should be made larger than at present, and that this also applied to the flex."

I quite realise that the error in the report is probably not yours, as the Press is supplied with a very condensed summary by the I.E.E. The error, like many other installation troubles, has been presumably due to condensation.

F. CHARLES RAPHAEL.

London, W.C.1, *December 18th*, 1931.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Repulsion-start Induction Motors

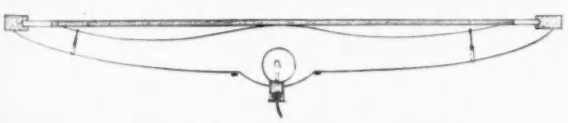
CROMPTON PARKINSON, LTD., Bush House, Aldwych, W.C.2, have recently added to their comprehensive range of motors a single-phase repulsion-start induction motor in sizes from 1 to 7½ h.p. This motor has been named the "B.R.I." to

"B.R.I." armature showing radial commutator, governor weight and part of brush-raising gear

emphasise its British construction and its type—brush-raising, repulsion-induction. It is made for voltages of 200/250 or 400/500, series-parallel connections being provided, and for frequencies of 40, 50 and 60 cycles. It may be started with an ordinary faceplate starter, when it will exert full-load torque and take about 150 per cent. full-load current on the first step, or it can be switched direct on to the line and will then start up against 3½ times full-load torque or more. Having reached speed, the brushes are raised and the commutator short-circuited by simple and reliable mechanism, and the machine then runs as an ordinary induction motor. It is maintained by the company that in the running position there is no brush or commutator wear or friction, no possibility of commutation trouble and no radio interference. The starting characteristics are very similar to those of the series d.c. motor. The brushgear is mounted on a special rocker which can be rotated to reverse the direction of the motor, simply by slackening two screws. The brush holders are solid brass die castings, thus eliminating any possibility of trouble due to loosening of rivets in built-up holders. Ball and roller bearings are fitted in grease and dust-proof housings, and these, in conjunction with freedom from commutation troubles, ensure the minimum of expense for maintenance. The new motor is available in various enclosures to suit all industrial requirements.

Illuminated Mirror

The "Illume" mirror which has recently been marketed by MR. LOUIS ABERDEIN, 79, Queen Victoria Street, E.C.4, is



Construction of "Illume" mirror

available in several models of varying shapes, sizes and styles, and is particularly suitable for use in bathrooms, &c., because the glass does not become blurred in a vaporous atmosphere, due to the even distribution of heat over the back of the mirror. A domed cover at the back of the mirror has at its centre a parabolic nickel-plated reflector in which is fitted a 40-W lamp. With the exception of the parabola the inside of this cover is white-cellulose enamelled. In front of the lamp, between the lamp and the mirror, is a second dome with a semi-parabolic reflector at its centre, nickel plated on the lamp side. The peripheries of the two domes finish at the inner and outer edges of a translucent frosted border around the mirror, so that the light from the lamp is distributed over the area of the border and projected through it. In this way the subject of the reflection is illuminated without dazzle or shadow.

Soil-heating Cable

Excellent results have been obtained from the use of "Magnet" electric soil-heating cable manufactured by the GENERAL ELECTRIC CO., LTD., providing bottom heat in hotbeds, garden frames, &c. It is specially designed for burying in soil and offers many outstanding advantages; for instance, an abundant supply of heat is always at hand at the touch of a switch, and all labour for stoking, handling solid fuel and residual ash is eliminated. The cable consists of a conductor of resistance wire insulated with heat-resisting material, lead covered, jute braided and impregnated to protect the lead covering from corrosive action in the soil. It is supplied in standard lengths of 50 yards for use at 230 V, each length being loaded at 700 W. For other voltages the length is modified in proportion to the pressure.

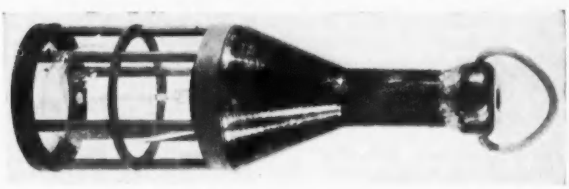
The system is particularly suitable in districts where specially low rates are available for electricity taken during the night. By using a time switch the operation of the bed can be made entirely automatic, and in cases where heating can be carried out during 24 hours a day the use of a thermostat for controlling the temperature is recommended to ensure maintenance of constant temperature and to avoid waste of energy.

Controlled-frequency Clocks

A very wide range of controlled-frequency synchronous electric clocks is now being offered by SYNCHRONOUS ELECTRIC CLOCKS, LTD., 179-185, Great Portland Street, W.1, controlled by Smith's English Clocks, Ltd. As the motor runs at only 200 r.p.m., compared with the 300 "swings" per minute of the balance wheel of an ordinary clock, there is practically no frictional wear. The movement is interchangeable with the standard 3½-in. drum movement fitted in a great proportion of ordinary clocks, so that it can be fitted in existing cases of intrinsic or sentimental value. A fixing ring; cream, silver or black dials; Arabic or Roman figures; and oxidised-silver, lacquered-brass, chromium-plated or black bezels are supplied with the movements. The standard equipment is designed for 200-250 V and 50 cycles.

A Fibre Handlamp

A handlamp recently produced by BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, N.17, is constructed of fabric-reinforced "Bakelite." It is fitted with strong cord-grips of the same material, and an all-porcelain one-piece b.c. or e.s. lampholder, suitably protected by a "Bakelite" skirt

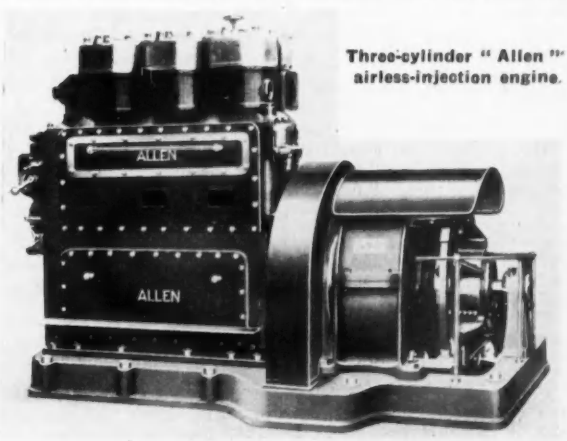


Benjamin fibre handlamp

covering the lamp cap. The guard is of high-quality fibre reinforced with insulated steel rods, and the handle is provided with a leather carrying loop.

Airless-injection Diesel Engine

The new airless-injection Diesel engine produced by W. H. ALLEN, SONS & CO., LTD., Bedford, is built in various sizes from 50 b.h.p. upwards, and has a very wide application. It is constructed with from two to eight cylinders according to the power required, the working parts of all engines having cylinders of the same dimensions being kept as far as possible the same size to enable the parts to be produced in quantities and to ensure interchangeability. The engine is of the vertical, single-acting type, working on the four-stroke principle. The fuel- and lubricating-oil consumptions are very low, the former not exceeding 0.39 lb. and the latter 0.005 lb. per b.h.p. per hour at full load for all engines except the smallest, for which the lubricating-oil consumption is 0.007 lb. per b.h.p. hour at full load. Before entering the engine the air is drawn through a silencer lined with sound-deadening material, while the exhaust silencer is provided with specially designed and very efficient baffles. The different sources of "out-of-balance" have been carefully investigated for all sizes of the engine, and careful attention has been given to the



Three-cylinder "Allen" airless-injection engine.

questions of stresses in the crankshaft due to torsional vibrations. The engine has trunk pistons, and the bedplate and cylinder trunk casting form a totally enclosed oil-tight crankpit of very rigid design. The fuel supply is maintained by a separate pump unit to each cylinder, and no distributors are employed. The fuel injector is of the spring-loaded type and is water cooled.

New Books

Tonfilm: Aufnahme und Wiedergabe nach dem Klangfilm Verfahren (System Klangfilm-Tobis). Leipzig: Verlag von S. Hirzel. Pp. xi+455; figs. 378. Price, with paper cover, 26 Rm.; bound, 27.80 Rm.

An English translation of the title of this elaborate and exhaustive publication may be summarised as "Sound Films (or Talking Pictures): Their Preparation and Display by the Klangfilm Method." It meets the same need in German-speaking countries for technical literature on the subject as Mr. C. M. R. Balbi, A.M.I.E.E., has provided in this country in his work, recently published by the ELECTRICAL REVIEW, on "Talking Pictures and Acoustics."

While the book is described as dealing with the Klangfilm method, it practically covers the whole field of talking-picture production and display, and the developments in Germany and the United States are dealt with at some length.

The technical side of the talking-film industry embraces so many different branches of scientific knowledge as to be almost beyond the capabilities of one or even two authors. Hence, in this case the plan has been adopted of inviting Dr. F. Fischer, of the Siemens & Halske Central Laboratory, and Dr. H. Lichte, of the A.E.G. Research Institute, not only to contribute sub-chapters on certain aspects of the subject, but to undertake the work of allotting the preparation of much of the material to the leading German experts in the particular phases of the subject, and of editing and collating into one volume the information thus got together. Thus, the book is really the joint production of no fewer than twenty experts—including the two Editors—on modern talking-picture production and display. The subject is dealt with in four main divisions: (1) The Development of the Talking-picture Industry; (2) Technical Details of Apparatus; (3) The Acoustics of Kinemas; and (4) A Description of a Modern Talking-picture Production Establishment.

The book covers every possible aspect of the talking-picture industry, so far as it has been developed, and, as the basic principles have been established, it should not be difficult to keep the work up to date in subsequent editions. A large number of diagrams and illustrations are included.

The Preparation, Selection, and Distribution of Coal. Pp. xxxi+182; figs. 5.

This book is based on a number of lectures arranged by the Coal Trade Luncheon Club, and is published under the auspices of that society and of the Institute of Fuel. The various sections have been written by experts in the particular subjects treated, and the book, which is very comprehensive in scope, contains much valuable technical information.

Attention is confined to British coalfields and conditions. The formation of these coal deposits and their distribution in Great Britain are explained. Various methods of classification of coal according to its chemical and physical properties have been formulated. Each class has its own special uses, unfortunately not always those for which it is employed. This is due to the fact that a large proportion of coal is still purchased on a price rather than on a suitability basis. Some guidance on this point is given in the chapters on utilisation.

Some idea is given of the engineering problems involved in coal mining and in the subsequent treatment of the coal when it reaches the surface, but no information is included regarding the resulting costs per ton at the pithead for the various classes of coal. There is no secret about these figures or the fact that certain grades of coal are sold below the average cost of production. If the purchaser knew how his 50s. was distributed he might be less likely to feel that the price was excessive. Some constructive criticisms of present marketing methods are given in a section on distribution by a member of a well-known firm of coal merchants. These comments are well supported in a short but very pertinent chapter on salesmanship, where it is written, "It is high time coal was sold instead of being offered for sale." This remark has a wider application.

Uniflow, Back-pressure, and Steam Extraction Engines. By ENG. LIEUT.-COM. T. ALLEN, R.N. (S.R.). Pp. xviii+660. London: Sir Isaac Pitman & Sons, Ltd. Price 42s. net.

The introduction, about 1910, of the specialised form of engine known as the "Uniflow," and the development of back-pressure and pass-out engines for industries requiring "process" steam as well as power, is the reason for the volume under review. The preference for the reciprocating engine in some industrial works is probably due to conservatism, for turbines are equally—if not more—suitable for back-pressure and extraction purposes, occupy less space for a given power, and cost less.

The contents of the book fall under two main headings: (*a*) Data and information for the design of uniflow stationary engines, and (*b*) A full description of actual methods of construction.

Considerable attention has been devoted to the principles and methods of standardisation in manufacture with the object of reducing first cost. This attention to capital cost is rather rare and refreshing in a technical book. The many and varying factors that influence design, and the efficiency and reliability of the finished product, are examined in proper detail with lucidity and thoroughness.

A separate chapter is devoted to condensing plant. The inability of the reciprocator to utilise a high vacuum makes the design of its condensing plant a relatively simple matter, and probably this section is adequate for the purpose; but it does not bear the same stamp of authoritative first-hand knowledge as the rest of the book. In large power plants the fundamental importance of obtaining chemically pure water for boiler feed has practically eliminated the jet type of condenser, but no attention is given to this point beyond a brief reference to oil eliminators.

Throughout the book bears evidence of clear thinking and the ability to evaluate the importance of the many variables involved. The arrangement is good; the information given is comprehensive and presented very lucidly.

Electric Train-lighting. By C. COPPOCK. Pp. vii+52; figs. 77. London: Sir Isaac Pitman & Sons. Price 7s. 6d.

This is the first comprehensive work on train lighting to become available in book form. Its scope is confined to steam railways, but the author treats the subject fairly exhaustively. He gives details of systems in use on British, American, and European railways, but the interesting methods used on Scandinavian railways have been omitted.

Separate chapters are devoted to the principal variable-speed and constant-speed (slipping-belt) systems. In each of these chapters details of the apparatus and the working of the system are carefully explained, and simplified diagrams of connections are given. The carbon-pile regulator, which is now being taken up by one European manufacturer of train lighting equipment, has been giving satisfactory service in industrial plants for a number of years, and is practically standard in the United States for train lighting.

The chapters on batteries (lead-acid and nickel-iron-alkaline) are good and contain much useful information. The book is good value for money.

Principles of Electrical Engineering, by G. C. BLALOCK. Pp. xvi+498; figs. 339. McGraw-Hill Publishing Co., Ltd. Price 24s.

There are very few features in this book to distinguish it from the numerous text-books on elementary electrical technology which have been published in America during recent years. The fundamental principles of both d.c. and a.c. circuits are explained very clearly, and the application of these principles is illustrated by more or less detailed treatment of plant and applications. The book is well illustrated, and, in addition to a good selection of exercises for the use of the student, there is a short list of laboratory experiments; the answers to the numerical examples should have been given.

In view of the very wide field covered in a limited space, some sections are necessarily rather superficial, e.g. the treatment of switch and control gear is very perfunctory. Moreover, the theoretical portions are not beyond criticism; the definition of power factor as the cosine of a phase angle, for instance, is not a good one. The omission of any reference to relays, protective gear, or automatic switchgear calls for comment, but the chapters which deal with electrical instruments and meters, and with electrical testing, though slight, are quite useful.

The book is stated to be for the use of students of engineering who are intending to specialise in branches other than electrical. For such students the work should prove quite acceptable, and practical engineers, who are not concerned with the more technical branches of electrical engineering, may also find the book useful as an up-to-date work of reference on the basic theory and applications of electricity.

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Shorter Notices.

"The Practical Handbook on Electro-plating." Pp. xi+329; fully illustrated. Published by Messrs. W. Canning and Co., Ltd., 133-137, Great Hampton Street, Birmingham.—The eleventh edition of this publication contains up-to-date information on chromium and cadmium plating and the special features of automatic electro-plating. Many new details of processes are dealt with. The book is a valuable and practical workshop guide for the use of works managers, foremen, and electro-platers.

"Die Elektrischen Maschinen," by Dr. Ing M. Liwschitz. Vol. I. Second edition. Pp. x+381; figs. 374. Berlin: B. G. Teubner's Verlag. Price 18 Rm.—This volume is the first of a series of three on the general subject of electrical machines, and deals with such matters as the magnetic field, transformers, the windings of d.c. and a.c. generators, asynchronous and synchronous machines, commutators, and converters. The text has been thoroughly revised.

"The Practical Engineer Pocket Book and Diary." Pp. cx+598; illustrated. London: Oxford University Press. Price, 3s. leather-cloth, 2s. 6d. cloth.—In the 33rd edition of this book any changes in the practice of electrical engineering are mentioned, while the sections relating to modern methods and improvements have been carefully revised. The publication is a helpful source of reference to the student and provides the practising and consulting engineer with an indication of the state of development of electrical equipment in its application to various industries.

"Industrial Electro-chemistry," by C. L. Mantell. Pp. viii+528; figs. 178. Price 30s. London: McGraw-Hill Publishing Co., Ltd.

"Arbeitsströmung einer Propellerturbine" ("The Active Flow in Propeller Turbines"), by Dr. Ing. F. Busmann. Pp. 24; illustrated. Berlin: V.D.I.-Verlag G.m.b.h. Price 5 Rm.

"Die Entwicklung des Fernsehens" ("The Development of Television"), by F. Fuchs. Pp. 30; figs. 19. Berlin: V.D.I.-Verlag G.m.b.h. Price 1 Rm.

Metal Reclamation. By C. Campbell

The cost of electrolytic recovery of precious metals from rich copper bullion is quite small

OF recent years electrolytic methods have become more and more popular in the recovery of precious metals from copper obtained by smelting processes. Electrolytic copper is a much more valuable commodity than the smelted metal, and all precious metals are recoverable. In this country, whilst smelting methods are still employed, the electrolytic system easily claims priority when gold and silver are present. Even goldsmiths' and jewellers' alloys, which abound on the silver scrap market, are smelted down in crucibles and, if not too impure, electrolysed direct.

When impurities do appear in the way of other base metals, they have to be removed by a refining, or skimming, process in the furnaces prior to casting into anode bars. If gold and silver are present the bars are re-melted and refined and then cast into iron moulds in the form of anodes. When the metal in the anode mould is on the point of solidifying, two small wire hooks are inserted and thus form a means of holding the anode in position in the bath.

Preliminary Considerations

The electrolysis of these anodes is conducted in earthenware troughs lined with lead to prevent the glazed material from being chipped by careless handling of the anodes or cathodes. Several troughs are employed, and adjacent to them is a small lead-lined wooden box into which the surplus electrolyte flows. In this process it is necessary to maintain a constantly flowing and heated electrolyte, the composition of which is approximately 10 per cent. sulphuric acid and 4 per cent. copper, or, alternatively, 25 per cent. copper sulphate. Should the copper content fall below this figure to any extent, it must be raised by the addition of a weighed proportion of copper sulphate crystals dissolved in water.

The anodes are arranged in line throughout the troughs in close proximity, about 1.5 inches apart from the cathodes. The hooks melted on to the anodes are slipped over copper rods, which hold the anodes in correct and uniform position in the bath. The cathodes simply consist of copper sheets so bent at one end as to permit of being similarly slipped over other copper rods representing the negative pole.

It is customary to have a large number of smaller anodes connected in parallel, alternating with a large number of smaller cathodes similarly connected. The troughs are rectangular where the anodes and cathodes are inserted, but below this level taper to one point in the centre at the bottom where a large glass bottle is connected. The same electrolyte is re-used until it is too foul with impurities for further employment.

Conducting the Electrolysis

The cathode sheets are inserted in the bath, the anodes hooked on to their respective bars, and the current is switched (10 amperes per sq. ft.). When much silver is present an addition of a small amount of hydrochloric acid is made. This is not required when gold alone is present in the copper, as it separates out as a result of the electrolysis.

The electrolyte flows continuously to the storage box; when a pre-determined level of liquor has been reached a mercury switch sets in motion a small centrifugal pump, which raises the electrolyte from the storage tank to another of similar size overhead. The latter is heated by a steam coil and maintains the liquor in the troughs at 50 deg. C., gravity flow completing the cycle.

When tin or antimony are present in the copper anodes the liquor becomes opaque to a varying degree, depending on the proportion of these metals. An excess would tend to foul the electrolyte, increase polarisation losses, and impoverish the purity of the deposited copper by the mechanical occlusion of white tin and antimony oxides in the liquor.

As a general rule the amount of tin and antimony which accumulates in copper bullion is comparatively small; hence the customary practice is simply to avoid having many such anodes together in the same bath. As the electrolysis proceeds copper is deposited on the cathodes and the anodes slowly dissolve away to a mere skin.

Products of Electrolysis

When about a week has elapsed the electrolysis is stopped and the cathodes removed. The deposited copper is firm and clean; although there is a slight tendency for nodules to form on the outer edges of the cathodes, this is not sufficient to spoil the general appearance.

The electrolyte is permitted to stand for some time so that all suspended matter will separate out and settle on top of the leather bung of the glass bottle previously referred to. When all suspended matter has fully settled out, the bung is raised and the anode slimes run into the bottle below.

When the bottles at the bottoms of the different troughs have been filled the bungs are replaced and the contents permitted to settle over the week-end. The bottoms of the bottles are then opened and the sediment, plus what copper liquor is present, is emptied into an earthenware vessel and boiled with a little common salt, settled, filtered, and dried. Its composition varies rather widely owing to the variety of copper bullions on the market, but the following example gives a rough indication of the contents:—

	Per cent.		Per cent.
Insoluble	5	Tin	15
Lead	10	Silver	5–20
Copper	8	Gold	6–15
Zinc	15	Platinum	.01–0.6
Iron	0.4		

The slimes are thrown on to molten lead in a furnace, the remainder of the process being purely metallurgical.

From the above list it will be gathered that the chief object of the electrolysis of copper bullion is to recover the precious metals in a marketable form, whilst the pure copper obtained from the cathodes ranks as a by-product. In large copper refineries any small accumulation of precious metals is accepted as a by-product in the purification of copper.

It should be noted that the electrolytic system pays for itself and shows to best advantage in the case of copper bullion containing about 2 per cent. of silver and smaller amounts of gold. This metal comprises the usual average of copper bullion from jewellers' and goldsmiths' waste, but there are instances in which it contains 5 per cent. and upwards of silver and gold.

It is considered more economical to transfer the latter rich bars directly to the "test" furnace wherein the precious metals are recovered rapidly at the expense of the copper, which is removed in the form of litharge. Attempts at the direct electrolysis of rich copper bullion do not appear to have had very satisfactory results, probably due to the increased resistance set up by the excessive anode slimes which form. The application of superposed alternating current has been employed to eliminate the latter trouble.

Principal Features of the Process

The main features of the electrolysis process are as follows:—

1. In the sulphuric acid solution the copper is caused to pass from anode to cathode by the current action as in ordinary copper electrolysis.

2. The silver dissolved off the anode by the current action goes into solution, but the addition of hydrochloric acid precipitates it chemically as silver chloride, which is eventually added to the anode slimes.

3. The gold and platinum remain insoluble as anode slimes, but the washing action of the continually-flowing electrolyte causes them to precipitate.

4. The heating of the electrolyte and circulation reduce polarisation losses to the minimum.

5. The maintenance of a 10 per cent. acid solution ensures a firm and closely-adherent cathodic deposit of copper.

6. As regards current efficiency, the weight of copper deposited per ampère per square foot almost coincides with the theoretical figure, *i.e.*, the presence of the precious metals practically does not interfere with the process.

7. The cost of working the process is exceedingly small and compares more than favourably with that of any ordinary smelting practice.

8. About the only point which militates slightly against the unqualified acceptance of this process is the time occupied, since it would require large plant to even recover one ton of copper per week. As the amount of copper bullion on the market is somewhat limited, the practice is to have small plant working continuously the whole year round, with great accuracy, and it seldom requires any attention.

Special Electricity Orders

Special Orders have been approved amending the London and Home Counties Electricity District Order, 1925; in respect of the parish of Pleasley, in the rural district of Blackwell, in the county of Derby; in respect of parts of the rural districts of Alton and Petersfield, in the county of Southampton, and parts of the rural districts of East Preston and Westhampnett, in the administrative county of West Sussex; in respect of part of the rural district of Fylde, in the county palatine of Lancaster; for the transfer of the undertaking authorised by the Crediton Electricity Special Order, 1925; in respect of the rural district of Bootle and part of the rural district of Whitehaven, in the county of Cumberland; in respect of part of the rural district of Morpeth, in the county of Northumberland; and in respect of part of the rural district of Oswestry, in the county of Salop, and part of the rural district of Llanfyllin, in the county of Montgomery.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The Third Anti-Dumping Order

On Friday last week the Abnormal Importations (Customs Duties) No. 3 Order was issued by the Board of Trade. This imposed an *ad valorem* duty of 50 per cent. upon a number of additional commodities and took effect upon Saturday last, December 19th. Among the goods affected are the following: Illuminating glassware for use in connection with artificial light (other than oil lamp chimneys and miners' lamp glasses); wireless valves and similar rectifiers and parts thereof; electric incandescent filament lamps for 20 V and over and parts thereof; and fittings and accessories of the kind used in interior electric lighting systems, of the following descriptions: Brackets, pendants, candelabra and electroliers and fittings therefor; ceiling roses; fuse-holders and bases, fuse and distribution boards and boxes; lampholders; lanterns; shades, bowls and reflectors, and fittings and holders therefor; sockets, plugs, adaptors and connectors; switches; table and floor standards; and parts of any of these articles.

The Reasons for the Order

In an explanatory memorandum the Board of Trade states that in October the imports of the illuminating glassware covered by the new Order amounted to 16,000 cwt. and in November to 20,000 cwt. of the value of £58,000; in 1930 the average monthly imports were 11,000 cwt.

Wireless valves are already subject to a key industry duty of 33⅓ per cent. *ad valorem*. The number imported during October was 426,000, and during November 573,000, valued at £93,000. In 1930, the average quantity imported monthly was 149,000.

Imports of electric incandescent filament lamps for 20 V and over and parts thereof during November numbered 2,872,000, this being almost double the quantity imported in October and nearly three times the average monthly imports in 1930. The value of the imports in November was £97,000.

Fittings and accessories of the kind used in interior electric lighting systems are not shown separately in the monthly accounts. In 1930 the imports were valued at £41,000 per month. In October, 1931, this increased to £73,000, and a further increase to £95,000 occurred in November.

Employment During November

The December *Ministry of Labour Gazette* states that employment in the engineering industry during November continued bad; electrical engineering showed little change and remained slack. Compared with a year ago employment was worse in all sections of engineering and in all areas. The number of unemployed in the engineering industry as a whole at November 23rd was 266,587, representing a proportion of 26.5 per cent. (against 27.2 per cent. in October). In the electrical section the figure remained at 14.9 per cent., the total being 13,817. There was a decrease (from 13.5 to 12.9 per cent.) in the number of unemployed in the electric cable, wire and lamp manufacturing group, the total being 14,021, but in the electrical wiring and contracting industry the total of 3,485 showed a slight increase from 15.4 to 15.5 per cent.

Worthing and Electrical Contractors

After a full discussion and by the narrow margin of nineteen votes to eighteen, Worthing Town Council has reversed the decision it arrived at in General Purposes Committee, and has requested the Electricity Committee to arrange another meeting with the representatives of the local electrical contractors with a view, if possible, to an equitable basis of co-operation being arranged for the running of the Corporation's new electrical showroom.

New Electrical Showrooms for Ipswich

The Ipswich Electricity Committee is to adapt the Tower Ramparts premises, acquired by the Corporation for £7,076, as electricity showrooms, the cost being estimated at £6,500. The plans provide for adequate window space, accommodation in the basement for stores, room for the exhibition of electrical appliances on the first floor, and, on the second floor, a lecture and cooking demonstration theatre.

Window-dressing Competition at Exeter

In the "Things to use" class in a window-dressing competition promoted by the Exeter Chamber of Trade in connection with the Faraday Celebrations, Messrs. Friend and Horton, electrical engineers, were awarded third prize. In the class for the most original display Mr. P. T. Scott, electrician, was placed second.

Yarrow Contracts During 1931

During the current year Messrs. Yarrow & Co., Ltd., have received a large number of contracts for both land and marine boilers. Those for land work completed during the year include boilers, superheaters and economisers for Helsingfors Electricity Department and Toppila, Finland; designs of installations for Japan, and a boiler for H.M. Dockyard, Devonport. Work is also well advanced on the ten Yarrow boiler installations for the Greenwich power station of the London County Council. Orders received, on which work is proceeding, include boiler installations for N'Dola Municipality, South Africa, for the Assam Oil Co., and for Edinburgh Corporation. Important marine installations which have been carried out by the company, include four boilers for the P. & O. turbo-electric liner *Strathnaver*, designs of four water-tube boiler installations for the *Strathaird* and designs of six boilers for the turbo-electric liner *Rangatira*.

Recent Contracts

The General Electric Co., Ltd., has received an order from the London, Midland and Scottish Railway for the electrical equipment (Oerlikon system) of the new rolling stock required for the augmentation of the services on the company's London electrified lines, *viz.*, Euston-Watford, and Broad Street-Richmond. This order includes the whole of the traction motors, control equipment, and heating and lighting equipment for thirty-one coaches, together with a further quantity of traction motors and additional spares. The equipment will be generally similar to that previously supplied by the G.E.C. for the L.M.S. lines, and will be manufactured at the company's Witton works.

A special "Gecophone" all-electric receiver supplied by the Glasgow branch of the G.E.C. has been installed at the Victoria Infirmary, Glasgow. The receiver consists of screen grid, high-frequency, and detector valves, transformer-coupled to a bank of three pentode output valves. Choke and condenser filters are used between the output valves and the main distribution board. There are three output circuits to various departments of the Infirmary, and the wiring, which is carried out in lead covered cable, is connected in parallel to sockets at the head of each bed in the various wards. The wiring contractors were Messrs. McKerron & Scott, Ltd.

Messrs. C. A. Parsons & Co., Ltd., have recently received an order for three transformers, each of 6,000-kVA capacity, with a voltage ratio of 13,500/3,000, and for 26 auxiliary transformers of lower voltage ratio, to be used in connection with the new Dunston power station.

Messrs. Hick, Hargreaves & Co., Ltd., Bolton, have been awarded the contract for the whole of the central evaporating plant for the Barking power station extensions of the County of London Electric Supply Co., Ltd.

The British Thomson-Houston Co., Ltd., has secured from the Admiralty a large order for "Mazda" gasfilled lamps.

Social Event

The first whist drive and dance organised by the newly formed Social Committee of the Torquay electricity undertaking was held at the Medical Baths on December 15th, and was attended by 190 guests. The whole of the prizes were presented to the committee by local electrical contractors and they were handed to the winners by Mrs. G. J. Hollyer, wife of the engineer and manager of the electricity undertaking.

D.O.T. Trade Memoranda

A confidential memorandum on the appointment of agents, terms of payment and methods of trading in Italy, prepared from information furnished by the Commercial Counsellor to H.M. Embassy at Rome, has been issued by the Department of Overseas Trade to firms whose names are entered on its Special Register. United Kingdom firms desirous of obtaining a copy of this memorandum should apply to the Department, 35, Old Queen Street, S.W.1, quoting reference number C.X. 3750.

G.E.C. Works Visit

On December 11th a party of forty students, consisting of Oxford Rhodes Scholars and overseas undergraduates at Cambridge, accepted, through the Association of British Chambers of Commerce, the invitation of the General Electric Co., Ltd., to visit the research laboratories and the lamp works at Wembley.

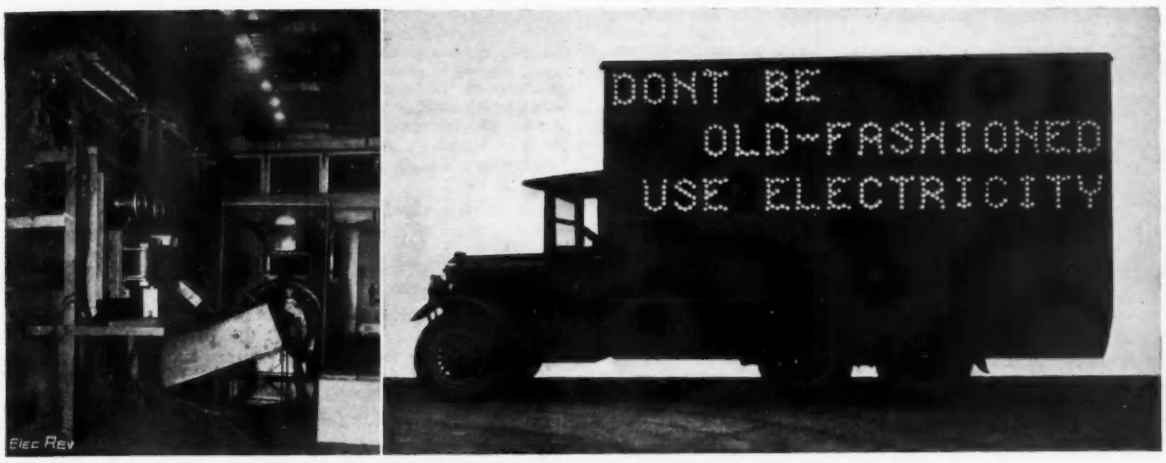
Obsolescence of Machinery

According to *The Times*, members of the Association of British Chambers of Commerce have been notified that a special committee of the Association has met Mr. P. J. Grigg, the chairman of the Board of Inland Revenue, and discussed proposals for income-tax allowances for obsolescence of plant and machinery. Mr. Grigg informed the committee that there were cases to which further consideration was promised in order to see whether, on a more liberal interpretation of the law, an allowance could be given. An example was that of an electricity undertaking which gave up generation and took a bulk supply from another undertaking. The existing generating plant was scrapped and no new generating plant was substituted, but expenditure was incurred on such plant as transformers. On further consideration the Board had reached the conclusion that in this case it would be justified in taking the view that the word "replacing" in their rules did not necessarily imply only the substitution for existing plant or machinery of plant and machinery performing the same functions. They were prepared to act on the view that the essential purpose of the business was the supply of electricity to consumers, that this had not changed, and that an allowance could in future

be made within the limits of the rule, by reference to the cost of the old generating plant discarded and that of the new transformers and other appliances installed. Similar considerations would apply in the case of the manufacturer who had hitherto had a generating plant for the supply of electricity to his factory, and who now decided to scrap his generating plant and to take a public supply, installing such plant as transformers for the purpose.

A Changing-sign Van

Something new in the way of advertising is offered by the "Mectric" mobile sign which has recently been put on the road by Touring Electric Signs, 3, Wine Office Court, Fleet Street, E.C.4. On each side of a 2½-ton six-wheeled commercial vehicle chassis is a 14½-ft. by 4½-ft. changeable sign. It contains 2,688 electric lamps arranged in groups of twenty-eight, each group capable of forming any letter, figure or character. The lamps are protected by glazed panels and



Interior and exterior views of the "Mectric" mobile advertising sign

shine brilliantly even in the daytime. An advertisement remains displayed on both signs for a period of six seconds, after which a new announcement appears after an interval of three seconds. Inside the van to provide the electricity required is a "Canning" dynamo driven by a "Petter" engine. "Exide" batteries are used. The electrical installation was carried out by the Imperial Lighting Co.

One of the first bodies to take advantage of this novel form of advertising is the British Electrical Development Association, one of whose slogans is shown in our right-hand picture. The Mectric is now on a tour of the London suburbs which will last until the middle of May. A fixed electric sign—"Buy British"—on the front of the van indicates that the present tour is devoted exclusively to advertising British goods.

Russian Electrical Imports

The following table showing the value of electrical machinery and cognate material imported into Soviet Russia during 1929 and 1930 is taken from a recent issue of the *E.T.Z.*:—

	1929. Value 1,000 Roubles	1930. Value 1,000 Roubles
Electrical machinery	9,438	11,360
Transformers	2,326	7,230
Other machine components	860	1,607
Electrical apparatus	11,365	19,019
Cables and wire	680	463
Incandescent lamps	127	90
Electrical fittings	497	454
Carbon electrodes	652	1,862
Measuring instruments	2,601	2,628
Accumulators and parts	746	992
Low-pressure apparatus	3,426	1,221
Electro-medical apparatus	663	424
Insulators	557	625
Electric locomotives, welding apparatus, &c.	626	1,243
Other electrical apparatus	72	12
Totals	34,636	49,230

A further table shows that Germany is credited with 44.4 per cent. of the imports, the United States with 25 per cent., Gt. Britain with 7.2 per cent., Austria with 6.7 per cent., Switzerland with 5.5 per cent., Sweden with 4 per cent., France with 3.4 per cent., and other countries with 3.8 per cent.

Swedish Foreign Electrical Trade

The imports of electrical machinery into Sweden during October last attained a value of approximately £195,590 as compared with £161,980 in the corresponding month of 1930. The exports of this class declined from £353,720 to £212,670.

German Electrical Imports and Exports

The recently published official returns show that the imports of electrical machinery and apparatus into Germany during October last were valued at £183,400, bringing up the aggregate imports during the first ten months of the year to £1,550,500, as compared with £1,749,700 in the corresponding period of 1930. The exports of similar material from Germany are returned at £2,261,200 for October last and £19,956,100 for the ten months, the latter figure comparing with £23,778,900 in the corresponding period of last year. The import total was made up of £292,150 of electrical machinery, and parts and apparatus to the extent of £1,258,350. The respective figures for the exports were £3,601,650 and £1,635,445.

Polish Electrical Imports

During September last Poland imported conductors, apparatus, and other electrical materials to the value of 3,239,000 zloty.

Leeds Contractors' Protest

A protest letter sent recently by the Leeds branch of the Electrical Contractors' Association, to the Corporation Electricity Committee, objecting to the prospective sale of electrical fittings in the new showrooms in the Headrow (now under construction) has met with no definite reply from the Electricity Department as yet, but work on the new showroom was suspended last week, pending the Committee's consideration of which classes of goods and fittings shall be offered for sale and which shall merely be displayed. The electrical contractors object to sales at all in competition with them but do not object to an extended showroom. The construction of the new building is an outcome of the demolition of the old premises under the Headrow scheme. The contractors also object to the Department's wiring activities. Alderman H. Lupton, chairman of the Electricity Committee, declares that the Committee hopes to work in harmony with the local contractors and to benefit them as well as general consumers.

Visit to B.T.H. Works

The Overseas Association of the British Thomson-Houston Co., Ltd., held its annual dinner on December 11th, at the Grand Hotel, Rugby, and in the afternoon the Rugby works were visited by Sir Thomas Wilford, High Commissioner for New Zealand, and Sir Bhupendra N. Mitra, High Commissioner for India, who were accompanied from London by Mr. J. L. Wilson, director of the company, and Mr. B. F. McMurtrie, manager of the Export Department. On arrival

STANDING:—E. J. Summerhill, E. G. Taylor, B. F. McMurtrie, A. P. Young, A. W. Weekes, M. R. Emanuel, C. E. Fenwick.
SITTING:—J. J. West, J. L. Wilson, Sir Thomas M. Wilford, H. N. Sporborg, Sir Bhupendra N. Mitra, F. Fraser, E. W. Ackland, G. M. Campbell.

At the B.T.H. works

at the works, the visitors were received by Mr. H. N. Sporborg, Mr. F. Fraser, Mr. G. M. Campbell, directors, and Mr. A. P. Young, works manager. They then visited the various departments, where they saw many large machines in process of manufacture, including the two 75,000 kW turbo-alternators for the new Barking extension of the County of London Electric Supply Co., Ltd., four of the 12,000-kW water-wheel alternators for the Uhl River hydro-electric schemes, and a

4,500 h.p. induction motor for driving a continuous rolling mill in Australia.

At the dinner in the evening Sir Thomas Wilford referred to the development of the Dominions and said this was largely due to the electrical industry. Sir Bhupendra N. Mitra, speaking of the development which had taken place in India due to the electrical industry, referred to the new Shannan power station in the Punjab, the electrical equipment for which is being supplied by the B.T.H. Co. Mr. E. G. Taylor said the Overseas Association was almost a year old and already had about 150 members, in many parts of the world.

For Sale

A 290-300-h.p. compound reciprocating engine with generator is offered for sale by Bury St. Edmunds Electricity Department. (See our advertisement pages to-day.)

Trade Announcement

Messrs. H. A. Neale & Co. have changed their address to Kingsgate House, 114-115, High Holborn.

A display of Christmas presents by Croydon Corporation

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, Etc.	Price Dec. 23rd.	Fortnight's Inc. or Dec.
a Acid, Oxalic .. .. per lb.	5½d.	—
a Ammoniac, Sal .. .. .. per ton	£60	—
a Ammonia, Muriate (large crystal) .. ,,	£52	—
a Borax .. .. ,,	£17	—
a Copper Sulphate .. .. .. ,,	£25 10s.	—
a Potash, Chlorate .. .. .. per lb.	3d. to 4d.	—
a ,, Perchlorate .. .. .. ,,	5½d.	—
a Shellac T.N. .. .. per cwt.	£4 5s.	—
a Sulphur Commercial .. .. .. ,,	£11	—
a ,, Roll .. .. ,,	£11	—
a Soda, Chlorate .. .. per lb.	3d.	—
a ,, Crystals .. .. .. per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks .. per lb.	5½d.	—
METALS, Etc.		
b Aluminium, Ingots .. .. .. per ton	£95 to £100	—
b ,, Wire .. .. .. per lb.	1/1 to 1/9	—
b ,, Sheet and Foil .. .. ,,	1/1½ to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I .. .. .. per ton net	£134	£2 inc.
Grade II .. .. ,,	£96	£2 inc.
Grade III .. .. ,,	£54	—
c Brass (rolled metal 2" to 12" basis) .. per lb.	8d.	¼d. inc.
c ,, Tubes (solid drawn) .. .. ,,	10d. to 10¼d.	—
c ,, Wire, basis .. .. .. ,,	8¼d.	¼d. inc.
c Copper Tubes (solid drawn) .. .. ,,	11d.	—
f ,, Bars (best selected) .. .. per ton	£75	
f ,, Sheet .. .. ,,	£75	—
f ,, Rod .. .. ,,	£75	
d ,, (Electrolytic) Bars .. .. ,,	nom.	—
d ,, ,, Sheets .. .. ,,	nom.	—
d ,, ,, Wire Rods .. ,,	nom.	—
d ,, ,, H.C. Wire .. per lb.	7¾d.	⅛d. inc.
f Ebonite Rod .. .. ,,	1/3 to 1/6	—
f ,, Sheet .. .. ,,	1/3 to 1/6	—
a German Silver Wire .. .. .. ,,	2/2	—
h Gutta-percha, fine .. .. .. ,,	nom.	—
h India-rubber, Para fine .. .. ,,	4¼d.	¼d. inc.
i Iron, Pig (Cleveland No. 3) .. .. per ton	58/6	—
l ,, Wire, galve. No. 1, P.O. qual. ,,	£20	—
g Lead, English pig .. .. .. ,,	£16 15s.	5s. dec.
g Mercury .. .. per bot.	£20 10s.	—
e Mica (in original cases) small .. per lb.	6d. to 3/6	—
e ,, ,, medium .. ,,	4/- to 8/-	—
e ,, ,, large .. ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings .. ,,	1/1¼d.	—
p ,, ,, drawn bars & rods ,,	1/1¾d.	¼d. inc.
p ,, ,, rolled strip & sheet ,,	1/-	¼d. inc.
p ,, ,, wire .. .. ,,	1/1¼d.	¼d. inc.
o Platinum .. .. per oz.	£11 6s.	7s. 6d. dec.
d Silicium Bronze Wire .. .. .. per lb.	9d.	⅛d. inc.
r Steel, magnet, in bars .. .. ,,	7½d.	—
g Tin, Block (English) .. .. .. per ton	£142 15s. to £144 15s.	£3 inc.
n ,, Wire, Nos. 1 to 16 .. .. per lb.	3/1	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

A New Domestic Appliance Company

The works of Messrs. Orr, Watt & Co., Ltd., bridge builders, Carfin, which have been standing idle for some time, are to be taken over by British National Electrics, Ltd., which will manufacture electric cookers, radiators, cleaners, &c. The new concern will commence operation when its new plant is installed early in the New Year. The company has a capital of £10,000.

The German Electrical Industry

The *Board of Trade Journal* contains extracts from the quarterly report of the German Market Research Board (up to November 27th). From these it is seen that on the whole employment fell off in the electrical manufacturing industry, but large firms were less affected than medium-sized and small works. Although exports showed a seasonal increase the downward tendency of foreign sales, in comparison with previous years, was continued.

New French Companies

Among the concerns recently formed in France are the Société Générale Electrique du Nord, Lille (36, Rue de Marquilles), capital 200,000 fr.; La Société des Fours Electriques Russ, Paris (25, Avenue Ledru-Rollin), 125,000 fr.; La Société Nantaise de Téléphonie pour l'Installation, la Vente et la Location Picart-Lebas, Nantes (46, Rue de Gigant), 1,500,000 fr.; La Société des Forces Motrices de la Haute Vezere, Paris (10, Rue Vezelay), 100,000 fr.; and La Société d'Etudes pour la Valorisation de l'Energie par Accumulation, Paris (9, Rue Louis Murat).

Italian Lamp Production

The number of electric lamps produced in Italy during July last amounted to 2,080,561, bringing up the total for the first seven months of the year to 13,216,831, as compared with 14,490,249 in the corresponding period of 1930.

Siamese Import Duties

Among the goods included in the new Siamese Customs tariff, which came into force on November 1st, are telegraph, telephone and radio apparatus, on which a duty of 5 per cent. *ad valorem* has been imposed.

Calendars and Diaries

A view of a well-known Swiss beauty spot decorates each monthly sheet of the calendar of British Brown-Boveri, Ltd. Under the last leaf is a complete calendar for the year.

A page-a-week diary bound in blue suede has been received from the Stanton Ironworks Co., Ltd. It includes 72 pages of technical information.

The 1932 diary of Messrs. Elliott Brothers (London), Ltd., contains a number of useful electrical formulae and tables.

Mr. Fernand Espir has sent us a refill for the desk calendar of Tréfileries et Laminoirs du Hâvre.

A reproduction of a painting of Glen Falloch by Brownlie Docharty illustrates the calendar of Messrs. Christy Bros. and Co., Ltd.

The calendar of Messrs. Christopher Wade—always one of singular artistry—this year bears a picture of a girl in fancy dress.

"Port, After Stormy Seas," is the title of the beautiful sea study on Messrs. L. W. Foote's calendar.

The Enfield Cable Works, Ltd., has again sent us one of its handy and handsome desk memorandum pads.

"Beeantee" Illuminations, Ltd., has sent us an attractive all-metal letter opener.

We have again received the annual diary of the Association of Engineering and Shipbuilding Draughtsmen. The technical matter has been considerably revised.

New Catalogues and Lists

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A brochure entitled "Britain Illuminated," containing some excellent pictures of floodlighting installations.

Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, W.C.2.—An illustrated catalogue of Ediswan "X-ray" reflectors.

British Home and Office Telephone Co., Ltd., 272-274, Vauxhall Bridge Road, S.W.1.—A leaflet relating to the company's intercommunicating telephone system.

Heyes & Co., Ltd., Water-Heyes Electrical Works, Wigan.—The December number of the "Wigan Review," containing particulars of the lighting installation at Sparkhill Baths, Birmingham.

Ferranti, Ltd., Hollinwood, Lancs.—A pamphlet illustrating and describing synchronous electric clocks.

James Howden & Co. (Land), Ltd., Caxton House, Westminster, S.W.1.—A catalogue giving details of the company's latest types of boiler plant and fans.

Hailwood & Ackroyd, Ltd., Morley, Leeds.—Leaflet H.W. 35/3, showing a new range of built-up pendant, wall and ceiling fittings. Also leaflet G.W. 129/2, dealing with the company's latest designs of carved art panels, bowls and globes.

National Lighting Co., Ltd., 15, St. Bride Street, E.C.4.—A catalogue of electric lighting fittings and accessories. Illustrated and priced.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Pamphlet No. 837, describing an inverse-time-limit over-current relay with adjustable definite minimum-time setting.

Galsworthy, Ltd., 16. Newman Street, W.1.—An illustrated catalogue of "Panelite" modern electric lighting fittings.

Dimmers (1926), Crown Works, Berryman's Lane, Sydenham, S.E.26.—A leaflet describing "Lowa" resistances for fans, lamps, motors and cinema and theatre use.

Tok Switches, Ltd., 103, Kingsway, W.C.2.—A folder illustrating and describing "Tok" rotary switches which are British made throughout.

Private Arrangements

E. A. Crawford and **A. W. Crawford** (trading as "The Trinity Radio-Gramophone Co."), 52, Stapleton Road, Bristol.—The creditors of this firm met recently, when a statement of affairs was submitted by Messrs. E. T. Collins & Son, 28, Baldwin Street, Bristol, which showed liabilities of £367. In addition there were preferential claims of £69; the assets were estimated to realise £60. The position was attributed to lack of capital. A resolution was passed in favour of a deed of assignment being executed to Mr. Arthur Collins. In a circular issued by the accountants it is stated that they are negotiating for the sale of the business, and it is anticipated that the part of the preferential claims, which exceed the assets, will be withdrawn, and thus enable the trustee to pay a small dividend to the unsecured creditors. The following are the principal creditors:—Sloan Electrical Co., £67; Eastick, J. J., & Sons, £104.

F. Smith, wireless dealer, &c., 117, Beckett Street, and 86, Stoney Rock Lane, Leeds.—At a recent meeting of creditors held in Leeds, a statement of affairs was presented showing liabilities of £300, all due to the trade. There were also fully secured creditors for £1,199. After allowing £22 for preferential claims, the net assets were £602, leaving a surplus of £302. No trading figures were available, but it was estimated that the gross profit during the last two years had been about £190. A deed of assignment had already been executed. In the absence of any offer it was decided to confirm the deed and a committee was also appointed.

Bankruptcy Proceedings

H. W. Adey, company director, 10, Lambolle Road, N.W.—This debtor attended on December 16th before Mr. Registrar Warmington at the London Bankruptcy Court for public examination upon accounts showing liabilities of £2,578 and assets of £30. In reply to the Official Receiver the debtor said that two previous failures were recorded against him, from both sets of which proceedings he had been discharged. From 1923 until January, 1929, he acted as director of various companies formed by him to acquire his inventions in wireless, all of which had since become moribund. In January, 1929, he formed Adey Radio, Ltd., to acquire from him an invention of a radio circuit. Shortly after its formation, disagreement arose among the directors and the company was unable through lack of finance to carry through the original agreement. The company was thereafter kept alive by his guaranteeing some of its debts and financing the company with money borrowed by him against the security of the foreign patent rights of the radio circuit. In June last an order was made on the petition of a creditor for the compulsory winding up of the company. He had since manufactured and sold wireless sets on his own account until this receiving order was made against him. The debtor attributed his insolvency to the failure of the companies with which he had been associated. The examination was concluded.

J. E. Roberts (trading as "Roberts and Goldthorpe"), engineer and electrician, Crosland Moor Mills, Huddersfield.—The public examination of this debtor was held on December 9th at Huddersfield, when a statement of affairs was presented which showed gross liabilities of £2,351, and assets expected to realise £841. Debtor attributed his failure to "experimenting on a special type of curling machine." The examination was closed.

C. C. Lewis, wireless engineer, &c., 27, Stanley Gardens, Paignton.—Receiving order made, December 10th, on debtor's own petition.

W. F. O. Sewell (Commercial Electrical Co.), electrical engineer, 24, James Street, Bradford.—Discharge granted subject to bankrupt consenting to judgment for £50, payable in fourteen days. £50 paid to Official Receiver in lieu of entering up judgment.

J. S. Blackburn, electrician, Borough Street, Castle Donington.—First and final dividend of 2s. 5¼d. in the £, payable December 23rd at the Official Receiver's offices, 22, Regent Street, Park Row, Nottingham.

A. R. King (Kingston Radio Co.), wireless dealer, 18, Vernon Street, Newark.—First and final dividend of 2s. 11½d. in the £, payable December 24th at the Official Receiver's offices, 22, Regent Street, Park Row, Nottingham.

T. H. Buxton, electrical engineer, 80, Bradford Road, Tingley.—Receiving order made December 16th, on debtor's own petition.

A. W. Creasey (Essex Electrical Storage Co.), engineer, Foundry House, Hall Lane, Walton-on-the-Naze.—First meeting, December 30th, at Bankruptcy Buildings, Carey Street, W.C. Public examination, January 7th, at the Law Courts, Town Hall, Colchester.

N. A. Wileman (A. Wileman & Co.), electrical engineer and contractor, 141, Commercial Street, Maesteg.—First and final dividend of 4½d. in the £, payable December 24th at the Official Receiver's office, Government Buildings, St. Mary's Street, Swansea.

Company Liquidations

Harris, Williams (Servis), Ltd., wireless manufacturers and dealers, 180-2, Albion Road, Stoke Newington.—The statutory first meeting of the creditors and shareholders were held on December 15th at the Board of Trade Offices, Carey Street, before Mr. Hutcheson, Official Receiver. The winding-up order was made on November 9th upon a creditor's petition. A draft statement of affairs shows total liabilities of £34,704 (ranking £30,027) and assets of £4,677 entirely absorbed by the claim of £15,650 by the debenture holder. The failure of the company is attributed to the sale of inferior productions of Johnson and Bolsom, Ltd. (for which it was the sole distributor), and other losses in connection with that company; to the falling through of the arrangement with the Federated European Bank to carry out the acquisition of the assets of Selectors, Ltd., and to extended credit allowed to customers. A resolution was passed appointing Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., to act as liquidator with a committee of inspection.

Mercurial Cut-Outs, Ltd.—Particulars of claims by January 30th to the liquidator, Mr. M. Lancaster, 46, Basinghall Street, E.C.

Electricity Supply

Lighting, Domestic, Power

Appleby (Westmorland).—MAXIMUM CHARGES.—At a recent meeting of the Town Council it was reported that the maximum price for energy under the electricity scheme would be 12s. 6d. for the first 15 kWh and 10d. per additional kWh per quarter for the two winter quarters. For the other two quarters the maximum price would be 8s. 4d. for the first ten kWh and 10d. each additional kWh.

Bexhill-on-Sea.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £2,890 to provide an additional supply to the Lunsford Company.

Brazil.—NEW DAM AT BANANEIRAS COMPLETED.—What is said to be the largest concrete dam yet constructed in South America has recently been completed at Bananeiras, in the State of Parahyba, in connection with the electricity supply scheme for the town and surrounding territory. The waters are taken from the only important river in the State, the Parahyba-do-Norte. The structure, called the Jerry O'Connel dam, is 1,150 ft. long, 197 ft. thick at the base, and has an average height of 131 ft. It is of the arch type, and is made of reinforced concrete, impounding 120,000,000 cu. ft. of water. The dam will increase the capacity of the Bananeiras power house from 4,000 to 9,000 kW. It is proposed to raise the capacity eventually to 18,000 kW.—*Reuter's Trade Service* (Parahyba).

Brighton.—SUPPLY TO NEIGHBOURING VILLAGES.—The Cuckfield Rural District Council has agreed to a scheme submitted by the Brighton borough electrical engineer for the supply of electricity to the villages of Fulking, Newtimber and Poynings, by means of overhead lines. These parishes are not in any supply area at present.

Bury St. Edmund's.—NEW TARIFF FOR BUSINESS PREMISES.—The Town Council has adopted a tariff for business premises with an annual charge of £12 per kW of maximum demand for the first kW, and £10 per kW beyond, and a "unit" charge of 1½d., less ¼d. per kWh discount for prompt payment of accounts.

Canada.—THE ST. LAWRENCE SCHEME.—Arrangements have been completed by the United States and Canada for an immediate meeting of the Joint Board of Engineers on the St. Lawrence Waterway Scheme.—Reuter (Washington).

Chichester.—EXTENSIONS.—The City Council is to proceed with the extension of mains to East Beach, Selsey, early in the New Year.

The electrical engineer has been instructed in future to purchase British meters only.

Continental.—PORTUGAL.—Statistics published by the Portuguese Administration of Electrical Services show that at the end of 1930 there were 395 generating stations in operation in the country. Of these, 75, with a total capacity of 36,606 kW are hydro-electric, while the remainder having a capacity of 113,802 are thermally operated. Only five stations have capacities of over 5,000 kW, and only twenty of over 1,000 kW, there being no fewer than 239 stations of under 100 kW. The total energy consumed in 1930 amounted to 224,273,755 kWh, of which 46,239,537 kWh was used for lighting, 43,261,475 kWh for traction, and 7,887,600 kWh for the chemical industry; the remaining 55,717,078 kWh represents the electricity produced by private concerns for their own use. Compared with the preceding year the total production of electricity made an advance of about 8 per cent.

RUSSIA.—Compared with 1928, the last year before the Five-Year Plan was put into operation, the output of electricity in Soviet Russia this year has risen by over 146 per cent. The total capacity of the power stations also shows a very big increase since 1928, this being due to the erection of a number of large stations in different districts. At the present time chief interest lies in the completion of the hydro-electric station now under construction on the Dniepr, in the Ukraine. The plant there will comprise nine turbines, each of 60,000 kW, the first two of which, it is expected, will commence working about the end of next April. It is claimed that this station will be the largest in Europe. The station at Kemerovo, in Siberia, now in course of erection, will, however, be over three times as large as the Dniepr station when completed.

FRANCE.—What is stated to be the highest dam in the world in connection with hydro-electric power stations is at present in course of construction at Corps in the Isère Department. The dam is situated at a height of 4,198 ft. above sea level, its purpose being to form an artificial storage reservoir having a diameter of about ⅝ mile and a depth of over 390 ft. The power station will be erected at a lower level so that the turbines will work under a direct head of 328 ft.

According to the *Revue Générale d'Electricité*, the output of the forty-eight principal electric power stations in France during September last amounted to 755,514,328 kWh, bringing the total for the first nine months of the year to 6,727,839,614 kWh, as compared with 7,350,848,277 kWh in the corresponding period of 1930, a decrease of nearly 9 per cent. Of the total, hydro-electric plants were responsible for 3,878,324,322 kWh and steam and internal-combustion engine stations for 2,849,515,292 kWh.

Croydon.—EXTENSIONS.—The Corporation is to provide a supply of electricity to the Stanford Road Estate at a cost of £1,770.

Darlington.—ELECTRICITY FOR SIGNS.—The Electricity Committee has decided to reduce the electricity charges for signs to £4 per kW of maximum demand plus ¼d. per kWh consumed.

Dorking.—LIGHTING OF INFIRMARY.—The Surrey County Council has made satisfactory arrangements with the London and Home Counties Joint Electricity Authority for the laying of a cable to provide electricity for lighting of the Dorking Infirmary, and has instructed the County Health Inspector to obtain quotations for wiring the building up to 90 points.

Durham.—SCHOOL LIGHTING.—The County Education Committee has received permission from the Board of Education to install electric lighting at the Hunwick Council School.

Exeter.—FIRE STATION INSTALLATION.—The General Purposes Committee recommends the installation of electricity throughout the main fire station and officers' quarters for lighting, cooking and heating.

BRITISH LAMPSHADES.—Under the Electricity Department's assisted wiring scheme 1,080 houses have now been wired, and further applications are receiving attention. The Electricity Committee has decided in future to provide only British lampshades.

LIGHTING OF HIGHWAYS DEPÔT.—The Streets Committee is to obtain tenders for lighting the offices and workshops of the highways depôt by electricity.

YEAR'S WORKING.—The accounts of the Corporation electricity undertaking show a net profit of £7,914.

Gold Coast.—PROPOSED HYDRO-ELECTRIC STATION.—The *Manchester Guardian Commercial* says that proposals are under consideration for the erection of a large hydro-electric power station on the Gold Coast to supply power for mining developments.

Guiseley.—SUPPLY TO CHEVIN END DISTRICT.—Following negotiations between the Urban District Council, the Electrical Distribution of Yorkshire, Ltd., and the Ministry of Transport, agreement has now been reached for supply to the Chevin End district mainly by overhead lines.

Hampshire and Surrey.—SPECIAL ORDER.—The Mid Southern District Utility Co. is to apply to the Electricity Commissioners for a Special Order authorising it to supply electricity in the rural district of Alresford, the parishes of Warnford, West Meon, Avington, Itchen Abbas, Martyr Worthy, and Morested, and parts of the parishes of Chilcomb Without, Easton, King's Worthy, Compton, and Godalming Rural.

Hoylake and West Kirby.—LOAN FOR TRANSFORMERS.—The Electricity Committee has decided to make application for sanction to the borrowing of £2,000 for transformers.

Japan.—ELECTRICAL PROGRESS.—A report issued by the Ministry of Communications says that there were 6,683 power stations in operation in Japan at the end of 1929, an increase of 191 during the year. The total capacity of the plants in operation was 4,193,623 kW, the respective totals for hydro-electric, thermal and other stations being shown in the table below :—

	In operation.	Under construction.	Total.	Inc. or dec. over 1928.
	kW.	kW.	kW.	kW.
Hydro-electric	2,581,949	1,325,788	3,907,737	− 75,884
Thermal	1,540,044	243,981	1,784,025	+ 164,738
Gas and other internal combustion engine operated	71,630	2,766	74,396	+ 15,098
Totals	4,193,623	1,572,535	5,766,158	+ 103,952

The total output of energy in Japan in 1929 is given as 11,977,366,000 kWh, of which 10,330,713,000 kWh was supplied by the hydro-electric plants, 1,632,088,000 kWh by thermal stations and 14,565,000 kWh by those operated by gas and other internal-combustion engines.

Lichfield.—LOANS.—The City Council has applied for sanction to loans of £2,000 for mains and services, £1,500 for meters, and £2,000 for assisted wiring.

London.—BATTERSEA.—The Electricity Committee proposes to carry out the following works: (i) Provision of services to 205 premises, £1,838; (ii) replacement with armoured cable of old vulcanised bitumen distributors in Latchmere, Nansen, and Queen's Roads, £4,570; (iii) provision of additional services to the premises of Damer Bros., Ltd., Culvert Place, £164.

Sanction to a loan of £45,000 for mains and services is to be applied for.

There was a net profit of £21,581 on the electricity undertaking for the year ended March 31st last. Of this £16,000 has been appropriated for capital purposes.

Additional electric heating apparatus is to be provided at the Central Reference Library at a cost of £114.

ISLINGTON.—The Electricity Committee has asked the engineer to prepare a scheme for the provision of switchgear in a new building which is to be designed by Mr. E. C. P. Monson.

HACKNEY.—The Finance Committee recommends that application be made to the Public Works Loan Commissioners for a loan of £140,000 for generating station extensions, the Urswick Road sub-station and meters.

STEPNEY.—The Finance and Parliamentary Committee recommends that £5,000 be allocated to carrying out further work under the assisted wiring scheme.

Lyme Regis.—THE FUTURE ELECTRICITY SUPPLY.—The Town Council has received a letter from the Electricity Commissioners stating that, having regard to the latest and more favourable financial reports, they understood that the present attitude of the Council was that it should continue to undertake the distribution of electricity in the borough at any rate for the time being. Future development might render it advantageous, however, for the consumers in Lyme Regis to be served as part of a larger undertaking. The Council has now decided to abandon its idea of selling the electricity undertaking.

Milton Regis.—SUPPLY TO NEWINGTON AND KEY STREET.—The Kent Electric Power Co. has informed the Rural District Council of its intention to lay h.p. and l.p. cables for a supply of electricity to the villages of Newington and Key Street.

Nelson.—CONCESSION TO INDUSTRIAL CONSUMERS.—Cheaper electricity for industrial purposes is to be provided by the Electricity Committee in an endeavour to put industries on a more competitive basis, and to attract new industries.

Netherton Colliery (Northumberland).—HOUSE LIGHTING SCHEME.—Electric lighting is to be installed in the miners' houses which are at present illuminated by means of paraffin lamps.

Oswestry.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £878 for a sub-station and equipment.

Oxford.—COUNCIL TO PURCHASE ELECTRICITY UNDERTAKING.—The City Council has decided to purchase the electricity undertaking of the Oxford Electric Co., Ltd., for £460,000. An additional £110,000 will be required for changing over the supply system.

Paignton.—EXTENSIONS.—The Paignton Electric Light and Power Co., Ltd., is to extend its supply to King's Ash Hill and Tweenaway, for which purpose a transformer station will be erected at Tweenaway Cross.

Reading.—CORPORATION TO PURCHASE UNDERTAKING.—The Corporation is to give notice to the Reading Electricity Supply Co., Ltd., of its intention to purchase the electricity undertaking.

Ribchester.—INAUGURATION OF SUPPLY.—The supply of electricity from the Ribble power station was formally inaugurated on December 17th. The Mayor and Mayoress of Preston (Mr. and Mrs. T. C. Rainford) and a representative company of guests were entertained in the parish hall, which was decorated with coloured electric lights. The Mayoress switched on the supply at the Ribchester sub-station, and Mrs. Sidebotham, wife of the Rector, switched on the local supply. The work was commenced in August last, the ultimate aim being to supply the whole of the Longridge area. On completion a similar scheme will be inaugurated for the Garstang area. The estimated cost of the Longridge scheme is £17,800. About 80 per cent. of Ribchester's inhabitants propose to use electricity, whilst at Grimsargh the percentage will be 90; already there are 150 consumers, 40 houses also having cookers installed. The Ribchester supply is provided by a 6,600-V three-phase line from the Preston network, some nine miles of cable having been necessary. The completion of the scheme is a further step in Preston's scheme for providing electricity in rural districts.

Councillor H. E. Rhodes, chairman of Preston Electricity Committee, said that Preston Corporation was taking risks in proceeding with rural electrification, and Ribchester must use electricity or Preston would lose on its venture. The Electricity Department's first scheme at Longton and Hoole was satisfactory and the one at Kirkham and Wrea Green would have been a success but for industrial depression. The third was at Woodplumpton, and Ribchester and Grimsargh was the fourth. Longridge and the Garstang district were to follow. In Ribchester's undertaking they had laid 12¾ miles of mains, and there were seven sub-stations, the whole project having cost £17,500. Preston's undertaking was the envy of many. Last year it added 3,000 consumers, and in ten years had increased its annual output from three million to 100 million kWh. He appealed particularly to agriculturists to become interested in the electrification of their industry.

Richmond (Surrey).—CHEAPER ELECTRICITY.—The Richmond Electric Light and Power Co., Ltd., has reduced the charges for electricity as follows :—Lighting flat rate for domestic and business premises: To 5½d. per kWh. Lighting supplies through prepayment meters: 7d. per kWh where the installation is the property of the company, and 6½d. per kWh where the installation belongs to the consumer. Power: 2d. per kWh, subject to certain discounts. Power between 10 p.m. and 6 a.m., subject to the consumer's bearing the cost of separate circuits and rental of a two-rate meter and time switch: 1½d. per kWh. Heating: First 750 kWh per quarter, 1½d. per kWh; next 500 kWh per quarter, 1¾d.; beyond, 1¾d. Shop lighting after 7 p.m.: 2½d. per kWh. There is also a new two-part tariff for domestic purposes, with a standing charge according to the dimensions of the premises, plus a "unit" charge of ¾d. A similar tariff for business premises has a standing charge of 6s. 3d. per quarter per 100 W of installed lighting, plus a "unit" charge of ¾d.

Ripon.—EXTENSIONS.—The City Council have decided to apply for sanction to a loan of £16,288 for the extension of the electrical distribution system in the rural area.

Salisbury.—OPPOSITION TO OVERHEAD LINES.—The City Council has decided to oppose the application of the Salisbury Electric Light & Supply Co., Ltd., for permission to use overhead distribution mains from Stratford-sub-Castle to a point in Stratford Road.

South Africa.—GRAHAMSTOWN.—A municipal poll has resulted in the acceptance of the proposals of Mr. A. E. Val Davies, consulting engineer, Johannesburg, for a new power station costing £35,200.

OTHER NEW SCHEMES.—Kroonstad (Orange Free State) ratepayers have approved a proposal for a new power station costing £60,000. The Frenchhoek (Cape Province) Municipal Council is to spend £5,000 on an electric lighting scheme.

Southend-on-Sea.—BULK SUPPLY.—Subject to an agreement being reached between the Corporation and the Shoeburyness Urban Council, a bulk supply is to be given to the latter town. Sanction to a loan of £11,875 is to be sought for the provision of the necessary mains and transformer stations, and a further loan of £2,169 is required to meet the cost of a new 3,000-V cable for the Pier, as well as £6,000 for alterations to consumers' apparatus.

Southfleet (Kent).—OVERHEAD LINES.—The West Kent Electric Co., Ltd., has given notice to the Council of its intention to erect overhead lines in various streets in the parish. The installation will be an experimental one.

Stewartry.—ELECTRICAL DISTRIBUTION SCHEME.—The County Council has decided to undertake a scheme for the distribution of electricity throughout its area at an estimated cost of £142,000. The Council will delegate the operation and management of the system to the Galloway Water Power Co., as under this arrangement the Council will receive a substantial grant from the Unemployment Grants Committee.

Stoke-on-Trent.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains to new schools at Watlands View, Wolstanton, at a cost of £1,100, and to an estate at Chell, which is being developed by the Chatterley-Whitfield Collieries, Ltd., at a cost of £280. Sanction to a loan of £20,000 for mains extensions has been applied for.

FLOODLIGHTING CHARGES.—Electricity for floodlighting is to be supplied at 1.4d. per kWh subject to the consumer's providing and maintaining the necessary separate wiring and time switch restricting the use of the supply to the period between 6 p.m. and sunrise the following day.

Swansea.—EXTENSIONS.—The Electricity Committee has arranged to provide a temporary supply of electricity to Messrs. Melville, Dundas and Whitson, the contractors carrying out a portion of the main drainage schemes at Mumbles Head, and a permanent supply to a pumping station to be erected near the Yacht Club, Southend, Mumbles, at an estimated cost of £3,020.

Swinton and Pendlebury.—ELECTRICITY CHARGES.—The Urban District Council has made the following alterations in the charges for electricity:—Domestic power: The addition of 25 per cent. to be discontinued. Rateable value tariff: All electricity consumed in excess of 1,000 kWh per quarter to be charged a ¼d. per kWh. Meter rents are to be discontinued as from April 1st next. Domestic power: Consumers to be required to guarantee a minimum consumption to the value of 5s. per quarter. Minimum charge: To be reduced for the June and September quarters from 5s. per quarter to 2s. 6d.

Tendring (Essex).—PROSPECTS OF SUPPLY.—It was reported at a recent meeting of the Parish Council that an electricity scheme for the district is to be proceeded with by the Colchester Corporation as soon as an unemployment grant can be obtained.

Thornton.—LOAN SANCTIONED.—The Urban District Council has received sanction to a loan of £2,413 for h.p. mains and plant.

Tilbury.—LOANS.—The Urban District Council has received sanction to borrow £3,048, excess expenditure on sub-station buildings and equipment. Loans of £1,500 for plant, £1,000 for hire-purchase wiring, and £500 for meters have been applied for. With regard to the proposed electrical installations in 53 Council houses, the Minister of Health has suggested that in view of the present financial situation the application for a loan should be deferred, but the Council has decided to continue to press for sanction.

United States.—NEW POWER STATION FOR LOS ANGELES.—*Power* states that instructions to report on a plan for construction of a 60,000-kW thermal generating plant by the City of Los Angeles at Wilmington, a harbour suburb, have been issued to a committee of the City's Department of Water and Power recently by the Board of Water and Power Commissioners. Plans for the project have been under consideration for some time, and construction will start as soon as possible.

Uttoxeter.—SUPPLY TO ROCESTER.—With regard to the supply of electricity to the parish of Rocester, the Electricity Commissioners have requested the Urban District Council to furnish them with figures as to the capital outlay and estimated revenue to be obtained from the scheme, and have reminded the Council that its statutory obligation to lay distributing mains in High Street and Mill Lane at that place expired on February 26th last. The Commissioners have been informed that the capital cost is estimated at £4,000.

Watford.—SUPPLY FOR NEON AND SIMILAR SIGNS.—The Town Council has adopted the following tariff for neon or similar signs or other apparatus having a low power factor:—Apparatus not exceeding one kVA capacity, 7d. per kWh, plus a meter rental of 1s. per quarter; or alternatively, 2½d. per kVA hour, through a special meter.

Traction

Ashington (Northumberland).—TRAFFIC CONTROL.—The Urban District Council has a scheme under consideration for the erection of traffic signals at the Grand Hotel corner at a cost of about £100.

Ayr.—TRAMWAY ABANDONMENT.—It is definitely intimated that the tramways will cease running on the last day of the year and that on January 1st the Scottish Motor Traction Co., Ltd., will begin to operate a service of 'buses over the tramway routes.

Continental.—SWITZERLAND.—In view of the increasing number of trolley-'buses in Great Britain, Germany, and other countries, attention is being devoted to vehicles of this type in Switzerland, where, at a meeting held recently in Zurich under the auspices of the Swiss Water Power Utilisation Union, papers were read on the subject by Swiss and German experts. During the course of the discussion it was stated that the municipal authorities of Lausanne have decided to introduce a service of trolley-'buses into that town. The vehicles, which are being built by the Brown Boveri Co., of Baden, will be fitted with 87-h.p. electric motors and will be capable of attaining a speed of 15 m.p.h.

GERMANY.—The tramways and underground electric railways are to lower their fares at the end of the month, when it will be possible to travel on either system from one end of Berlin to the other for 2½d.

Exeter.—TRAFFIC SIGNALS.—The Watch Committee is to install further automatic traffic signals at a cost of £258.

SALE OF TRAMWAY EQUIPMENT.—At a recent meeting of the Transport Committee the transport manager reported that he had disposed of the remaining thirteen tramcars for £100. The total sum received from the sale of tramcars, overhead material, scrap and obsolete spares, amounted approximately to £2,500.

Japan.—TROLLEY-'BUSES FOR KYOTO.—The Municipal Council has received permission to operate a trolley-'bus system in the city.

Newcastle-upon-Tyne.—TRAMWAY SERVICE TO CONTINUE.—The City Council has decided not to substitute omnibuses for tramcars on the Osborne Road route, and has instructed the Transport and Electricity Committee to re-lay the tramway track to enable the operation of the trams to continue.

Stoke-on-Trent.—TRAFFIC SIGNALS.—The Corporation is to obtain tenders for the installation of traffic signals at Burslem.

United States.—NEW YORK UNDERGROUND RAILWAY EXTENSIONS.—According to the *Manchester Guardian Commercial*, the New York Board of Transportation proposes to start work next year on a programme for the extension of the underground railway system, including new railways under 2nd and 6th Avenues to cost $117,000,000, a new line from Palmetto Avenue to 78th Street to cost $17,300,000, and a new line under Roosevelt Avenue to cost $6,000,000.

Whitley Bay (Northumberland).—AUTOMATIC TRAFFIC SIGNAL.—The Urban District Council has instructed its surveyor to get into touch with the county surveyor with a view to the erection of an automatic traffic signal at Marine Avenue.

Communications

Australia.—RADIO LICENCES.—Broadcast receiving licences increased in every State of the Commonwealth in October, the increase for the month being 3,580. New licences numbered 9,116, cancellations 5,536, and the total 330,179. New South Wales had 122,039, Victoria 132,968, Queensland 25,550, South Australia 31,155, Western Australia 9,961, and Tasmania 8,506.

Brazil.—RADIO-TELEPHONY.—The International Telephone and Telegraph Corporation and the British Postmaster-General announce that a second radio-telephone link between North and South America was opened on December 18th when Rio de Janeiro was connected for service with the United States, Mexico, and Cuba, over the 4,800-mile circuit between Rio de Janeiro and New York.

Through radio stations near New York the International system is already giving telephone communication between New York and Buenos Aires, while a service has recently been opened between Rio de Janeiro and Buenos Aires (for Argentina, Chile, and Uruguay) by means of the radio stations of the Companhia Radio Internacional de Brazil, a subsidiary of the International Telephone and Telegraph Corporation. The telephone system in Rio de Janeiro is operated by the Brazilian Telephone Company.

Birmingham.—THEATRE STUDIO.—The Repertory Theatre is the first, in this country at least, to have a permanent broadcasting studio. It is fitted with the latest form of echo-preventing boards and a central microphone, a control room being located a short distance away. Special attention will be given to the broadcasting of plays.

France.—RADIO INTERFERENCE.—The French Government has lately appointed a special Committee to inquire into, and report on, disturbance to radio reception caused by industrial and domestic electrical installations.

Siam.—TELEPHONY.—The Postmaster-General announces that a telephone service became available on December 17th between all parts of Great Britain and Northern Ireland and Siam, the route being by land-line to Berlin and thence by wireless to Bangkok. Communication is at present restricted to a special call office in Bangkok.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—January 20th. City Council. Ring main metalclad 6,600-V switchgear. (A.X. 11210.)*
February 3rd. Totally enclosed metalclad 6,600-V switchgear. (A.X. 11211.)*

Egypt.—CAIRO.—January 23rd. Ministry of the Interior. 3,175 meters for Mansourah. (A.X. 11215.)
February 18th. Diesel engine driven power station (400 kVA) for Samallout. (A.X. 11209.)*
February 18th. Water works with electric pumping equipment for Samallout. (G.X. 10962.)*
January 9th. Ministry of Public Works. Two electrically driven pumping sets, with accessories for floating dock. (G.X. 10989.)*

Fife.—December 31st. County Council. Various works, including electric lighting installation, in connection with 43 houses. Schedules from Mr. G. B. Deas, architect, Central Chambers, Kirkcaldy (deposit £1 1s.).

Galloway.—January 15th. Galloway Water Power Co. 11,000-V overhead line between Glenlee power station and High Bridge of Dee. (December 18th.)

Halifax.—January 2nd Tramways Committee. Electrical work at omnibus garage, Elm Wood. Specification and form of tender (deposit £2 2s.) from Mr. A. C. Tipple, borough engineer, Crossley Street.

Hamilton.—Electricity Department. E.h.p. and l.p. underground cables. (December 18th.)

India.—NEW DELHI.—January 5th. Indian Stores Department. Transformers and switchgear for the Punjab. (A.X. 11217.)*

Keighley.—December 29th. West Riding County Council. Installation of electric lighting at the Technical College. Particulars from the County Hall, Wakefield.

Knaresborough.—West Riding County Council. Electrical engineer's work at Sanatorium, Scotton Banks. Specification No. 7 (deposit £5) from the county architect, County Hall, Wakefield.

London.—CENTRAL ELECTRICITY BOARD.—January 25th. Construction of site works, foundation works, &c., (*a*) at Portishead and Upper Boat for the South-West England and South Wales Electricity Scheme, and (*b*) at Carlisle, Padiham and Kearsley for the North-West England and North Wales Electricity Scheme. (December 18th.)
February 15th. Central indication and telephone equipment and supervisory control equipment in the North-West England and North Wales area. (December 18th.)

Montgomery.—December 29th. Public Assistance Committee. Overhaul and rearrangement of the electric lighting plant at the Caersws Institution. (December 18th.)

New Zealand.—WELLINGTON.—February 8th. Post and Telegraph Department. 35,000 telephone dry cells. (A.X. 11212)*
February 23rd. Public Works Department. Four 1,000-kVA single-phase transformers, with automatic voltage regulating equipment. (A.X. 11213.)*
February 9th. Control and power cables for Waitaki power station. (A.X. 11214.)*

Northern Ireland.—ELECTRICITY BOARD.—January 18th. 33-kV overhead transmission line. (December 11th.)

Roxburgh.—December 26th. County Council. Electric lighting for housing scheme. Schedules from county clerk, County Offices, Newton St. Boswells.

South Africa.—DURBAN.—January 4th. Corporation. Arcing ground suppressor for 33,000-V overhead transmission. (December 18th.)

West Ham.—January 18th. Education Committee. Installation of electric lighting at Carter Road Central School. (See this issue.)

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Australia.—BRISBANE.—City Council. Accepted. Two step-up transformers (£1,785).—British Electric Transformer Co., Ltd.—*Tenders.*

Barrow.—Replacing six and reconditioning two feeder pillars (£311).—British Insulated Cables. Two pillars (£128).—Henley's. A.c. motors for installation at Roanhead Mines.—Metropolitan-Vickers; Lancashire Dynamo & Motor Co. Control gear for these motors.—George Ellison, Ltd.

Boxhill.—Electricity Committee. Recommended. Supply of cable: Renewal of contract for six months.—Enfield Cable Works, Ltd.

Birmingham.—Education Committee. Accepted. Electric lighting and power installation at Selly Park Council School (£207).—Hope's Heating & Lighting, Ltd.

Croydon.—Water Committee. Accepted. Wiring at Addington pumping station (£82).—Kingsdown Electrical Co.
Electricity Committee. Recommended. Switchgear (£828), two skeleton panels (£68), feeder panel (£203), transformer panel (159), three feeder switches and two transformer panels (£985), and switchgear (£3,006).—A. Reyrolle & Co. Oil-cooled transformer (£188).—Crompton Parkinson, Ltd. 250-kVA transformer (£130).—British Electric Transformer Co., Ltd. Wiring central garage (£123).—Messrs. Wingfield.

Darlington.—Electricity Committee. Accepted. Erection of overhead equipment for the new trolley-'bus route.—Clough, Smith & Co., Ltd.

Derby.—Electricity Committee. Recommended. Remodelling two boilers (£6,000).—International Combustion Co., Ltd.

Glasgow.—Police Committee. Accepted. Installation of internal telephones at police headquarters (£340).—Dictograph Telephones, Ltd.

Government Contracts.—The following contracts were placed by the various Government Departments during November:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT)
Motor alternators.—Electric Construction Co., Ltd.; Haslam & Newton, Ltd.
Alternators, motor generator and spare armatures.—Small Electric Motors, Ltd.
Receivers, amplifiers, tuners, note magnifiers, &c.—Radio Instruments. Ltd.; H. W. Sullivan; Plessey Co.
Panels, &c.—Marconi's; H. W. Sullivan; Gambrell Bros.
Transmitter-receiver units and aerial rods.—H. W. Sullivan.
Wavemeters, heterodyne units, oscillators and dials.—Plessey Co.; Marconi's; H. W. Sullivan.

WAR OFFICE
Generators.—Electro Dynamic Construction Co.

AIR MINISTRY
Ammeters.—Ferranti, Ltd.
Generator controls.—Everett, Edgcumbe & Co.
Switchboxes.—Phœnix Telephone & Electric Works.
Transmitters.—Johnson & Phillips.
W/t valves.—Mullard Radio Valve Co.
Aerial winches.—Walters Electrical Manufacturing Co., Ltd.

CROWN AGENTS FOR THE COLONIES
Electric motors.—G.E.C.
Train lighting spares.—Chloride Electrical Storage Co.

POST OFFICE
Telephonic apparatus.—Automatic Telephone Mfg. Co.; Ericsson Telephones; Phœnix Telephone & Electric Works; Siemens Bros.; Telephone Mfg. Co.
Testing and protective apparatus.—Phœnix Telephone & Electric Works.
Distributing boards.—Revo Electric Co.
Cable.—B.I. Cables; Connollys; Hackbridge Cable Co.; Standard Telephones & Cables.
Telephone Cords.—Phœnix Telephone and Electric Works; Standard Telephones and Cables.
Milli-ampere meters.—E. Turner.
Motor generators.—Small Electric Motors, Ltd.
Bronze wire (covered).—B.I. Cables; Enfield Cable Works.
Flameproof wire.—Macintosh Cable Co.
Submarine cable: Anglo-Belgian (1932).—Siemens Bros.
Power plant, Hull telephonic repeater station.—Haslam & Newton. Sub-contractors: Alton Battery Co. for batteries.
Electric lifts: Newcastle-upon-Tyne head post office.—Pickerings, Ltd. Derby, Midland Road branch post office.—W. Wadsworth & Sons.
Telephone exchange equipment.—J. & N. Philips (Manchester): Hereford: Wisbech; West Hartlepool; Hartlepool; Sutton Coldfield (Birmingham area): Siemens Bros. Sub-contractors for Sutton Coldfield: Chloride Electrical Storage Co. for batteries; Crompton Parkinson for ringing machines; English Electric Co. for charging machines. Acomb (York area); Cosham (Portsmouth); Burnham (Bucks): Horsfield (Leeds area): Automatic Telephone Mfg. Co. Sub-contractors for Horsforth: Alton Battery Co. for batteries; Electric Construction Co. for charging machine. Bury St. Edmunds: G. E. C. Welbeck (London area); London trunk exchange: Standard Telephones & Cables.
Telephonic repeater equipment extensions.—Catterick (Yorks); London (G.P.O. South).—Standard Telephones & Cables. Bristol.—G.E.C.

H.M. OFFICE OF WORKS
Electric lighting, &c., Cranwell R.A.F. College.—Kershaws (Electrical Engineers), Ltd.

Kettering.—Electricity Committee. Recommended. 250-kVA transformer (£119) and 120-kVA transformer (£87).—Brush Electrical Engineering Co., Ltd.

London.—HAMMERSMITH.—Electricity Committee. Recommended. Switchgear (£198).—General Electric Co., Ltd. Four 400-kW transformers (£640).—English Electric Co., Ltd.
WESTMINSTER.—Baths Committee. Recommended. Rewiring at Buckingham Palace Road baths (£329).—H. E. Keen & Co., Ltd.
ISLINGTON.—Housing Committee. Recommended. Electric lighting installation at Park House, Holly Park (£60).—A. E. Sandilands.
FULHAM.—Electricity Committee. Recommended. Kiosk with switchgear and two 100-kVA transformers (£428).—Metropolitan-Vickers Electrical Co., Ltd.

Manchester.—Wythenshaw Estate Special Committee. Provisionally accepted. Re-wiring for electric lighting and connecting to the public supply of Sharston Hall, Northenden.—E. M. Evans & Sons.
Transport Committee. Accepted. Battery-charging plant required at the Queen's Road car shed.—Lancashire Dynamo & Motor Co., Ltd.

Stoke-on-Trent.—Assistance Committee. Accepted. Wiring the Turnhurst Road institution (£240).—Barnett & Soans.

Taunton.—Great Western Railway Co.—Accepted. Three electric luggage lifts at Taunton station.—W. Wadsworth & Sons, Ltd.

Weymouth.—Town Council. Accepted. Electrical work at the new electricity showrooms (£630).—V. H. Bennet & Co.

Notes

A New One-ton H.F. Furnace

As a result of the successful operation of a ½-ton high-frequency coreless induction furnace in the works of Messrs. Thos. Firth & John Brown, Ltd., of Sheffield, a further order for a one-ton furnace has been placed with the Metropolitan-Vickers Co. This, it is claimed, will be the largest high-frequency induction furnace installed in England. It is generally similar to the ½-ton furnace, of which type several are in operation in this country.

Steel of a quality equal to that of crucible steel has been produced by the ½-ton furnace at about half the cost of the older method, and it is estimated that the larger unit will further reduce costs, including depreciation, interest, and overhead charges, by about 30 per cent.

The furnace box containing the water-cooled coil which surrounds the charge is mounted in a framework of non-magnetic steel in order to avoid any risk of over-heating due to stray magnetic field from the coil. The latter is of the patented construction developed by the Metropolitan-Vickers Co. being wound with half-inch copper strap with a tube on the outer edge for the circulation of cooling water. During the early stages of development it was shown conclusively that, even when some of the molten metal was allowed to break through the crucible and sand-filled space which normally separates the charge from the inside of the coil, no damage whatever was done.

The furnace tilting arrangements are driven by a mechanism which can be finely controlled for both backward and forward tilting, thus facilitating the removal of slag and providing accurate control of pouring operations. The motor-generator set consists of a 600 kVA single-phase 500-cycle, 2,000-V alternator with overhung exciter, directly coupled to a 1,500-r.p.m. slip-ring induction motor. The full furnace charge of 1 ton can be melted in approximately one hour.

The switchgear, with the exception of the starting equipment for the motor generator, is electrically operated and includes a furnace switch cubicle fitted with an electrically operated circuit breaker, protective relays, instrument transformers, &c.; a condenser panel; a remote control board located on the furnace platform; and a small controller for the tilting mechanism. The remote control panel is fitted with instruments for indicating voltage, current, and power factor, and with push buttons for operating the alternator circuit breaker.

The voltage and power factor are both automatically controlled, the latter by means of contactors, which switch in and out sections of a bank of static condensers. The furnace normally operates at unity power factor.

British Standard Specifications

Two new Specifications have been issued by the British Standards Institution. They relate to (424-1931) Vegetable-tanned Leather Belting and (425-1931) Forms and Dimensions of Boiler Rivets (as manufactured) from ½ in. to 2 in. in diameter. Copies may be obtained from the B.S.I., 28, Victoria Street, S.W.1, at 2s. 2d. post free.

New Parliamentary Bills

We publish below a list of proposals of an electrical nature that will come forward in the ensuing session of Parliament. Readers who are desirous of obtaining further information will find the notices published in the *London Gazette* for December 4th, 8th, and 11th.

Bournemouth and Poole Electricity Supply Co., Ltd., and Bournemouth and Poole Corporations, &c.—The postponement of certain undertakings of the company; provision for the purchase of those undertakings; regulation of prices to be charged by the company; and for other purposes.

North Metropolitan Electric Power Supply Co.—Further powers with regard to the electricity undertaking and for other purposes.

Newcastle-upon-Tyne Electric Supply Co., Ltd., and other companies.—The transfer to the Newcastle company of undertakings of certain other companies; to change the name and to confer further powers upon that company. (Particulars were given in our "City Notes" for December 11th, p. 901.)

Oakham Gas and Electricity Co., Ltd.—Further powers with regard to the company's undertaking.

South Wales Electrical Power Distribution Co.—To change the name of the company; to reorganise, increase, define and regulate its capital and borrowing powers, &c.

The I.E.E. and Medical Electricity

The Council of the Institution of Electrical Engineers has appointed a special Technical Committee to obtain papers on radiological and electro-medical subjects, and to deal with such other matters as may be referred to it by the Council. The aim is to stimulate and foster interest in the electrical engineering aspect of radiology.

The committee, which is representative of electrical engineers, medical men, and radiographers, is at present engaged in obtaining papers on the above subjects for reading before the Institution during 1932-33 and subsequent sessions.

I.E.E. Western Centre Dinner

The annual dinner of the Western Centre of the Institution of Electrical Engineers will be held on January 11th at the Royal Hotel, Cardiff.

Grid Field Tests

In the December issue of the I.E.E. *Journal*, Mr. J. S. Forrest describes briefly the electrical constants of transmission lines, with special reference to steel-cored aluminium lines. Where possible, simple formulæ are given for the calculation of the various quantities associated with transmission lines, and the limitations of these formulæ are indicated.

In the second part of the paper an account is given of the methods which have been adopted for the determination of the constants of the "grid" lines. Three typical lines of diverse characteristics, *viz.*, a 132-kV single-circuit line, a 132 kV double-circuit line both transposed, and a 33-kV untransposed single-circuit line, are considered and results are given of measurements of three-phase impedance, loop impedance, single-phase impedance, resistance, charging current, and induced electro-magnetic and electrostatic voltages.

Some of the measurements are novel, and the methods of measurement, which are very simple, should be of interest to those engaged in the routine testing of such lines.

Electricity in the Potteries

At the annual dinner of the N.W. Midlands branch of the E.A.W. which was held at Burslem on December 17th, those present included the Deputy Lord Mayor and Deputy Lady Mayoress, Mr. and Mrs. C. H. Yeaman, Miss D. Bentley, Mr. and Mrs. H. L. Mills, and Mr. F. Gurney. Mrs. Harry Leese, president of the branch, was in the chair. In proposing the toast of "The Association," Ald. Harry Leese referred to the opening for the members of the branch in teaching the use of electric cookers to people in the local newly electrified areas, in many of which there was no gas. Miss C. Haslett, C.B.E., responding, said that the average hours worked per week by the housewife were between sixty and seventy, but conservation of energy would be obtained by the use of electricity. One of the duties of the E.A.W. members was to explain to the housewife the "strange language" of the electrical engineer. Ald. H. J. Colclough mentioned the excellent results obtained by electricity in the firing of pottery, but thought the cost too high.

The Tunbridge Wells Grid Sub-station

There was a distinguished company of electrical men, including Sir Andrew Duncan, chairman of the Central Electricity Board, at the official opening on December 17th by the Mayor of Tunbridge Wells, Alderman A. Dennis, of the new sub-station of the Board and new switchgear in the Corporation's generating station (see our last issue, p. 915). At tea following the ceremony Mr. G. H. Nelson said that the Tunbridge Wells station was one of the most economical for its size in the country. During the last two years there had been shown an annual increase of three and a-half million kWh, bringing the total up to 15 millions for the past year. The Mayor alluded to the fact that Tunbridge Wells was not an industrial district; while the load was purely residential, the tariffs were extraordinarily low. The domestic rate was 10 per cent. of the rateable value and ½d. per kWh. During the past twelve months their hire-purchase scheme had attracted approximately 2,000 customers.

Mr. J. R. Beard congratulated the Electricity Commissioners on their far-seeing and bold scheme, which they now had the pleasure of seeing brought into visible form through the agency of the Board. In addition to Tunbridge Wells being connected to the pool of power in London, it was a fact that there was a continuous line of a thousand towers stretching 160 miles and linking up all the important undertakings in Kent to Brighton. In a few weeks' time it would be true to say that a similar continuous line of towers—2,250 in number—would stretch from Tunbridge Wells to the Tyneside. Of the many borough electrical engineers he had met, none had been more helpful than Mr. R. N. Torpy.

Mr. T. P. Wilmshurst said they had witnessed the marriage of the Central Board to Tunbridge Wells, and he hoped the ceremony was a happy augury for the partnership. He was quite sure that it would be to the great benefit of the consumers.

Mr. W. Alderson Smith submitted the toast of the Central Board, and Sir Andrew Duncan, in replying, said that foreigners to whom he had spoken had said that the greatest evidence they had seen in this country of rebuilding for the future was the national grid. When all the criticism had been forgotten the grid would stand as an accomplishment of which the country might well be proud.

Mr. Torpy said that what success had been achieved by his undertaking could not have been but for the backing he had had from the electrical committee and for the loyal assistance he had received from his deputy, Mr. Pownall, and his staff.

Electric Lamps in High Temperatures

The high-intensity automatic projector arc lamp boxes installed at the Bloomsbury Super Cinema in London (the first of their kind to be introduced in this country) have been in use for some five years in conjunction with the projection of sound pictures a distance of 100 ft. on to a 21 ft. by 17 ft. screen. The 500,000 c.p. arc lamps take 125 A at 90 V and the temperature inside the Russian-iron lamp houses is about 250 deg. C. In order to facilitate easy manipulation and inspection of the projectors, two separate lighting circuits were installed inside the lamp houses, and 60-W Osram lamps with e.s. caps were fitted, one being on the arc supply to act as a pilot, and the other on a 110-V a.c. lighting circuit used for inspection purposes, carbon renewals, &c. One lamp in each box functions continuously for ten hours each day, while the arc is in use. During the past fourteen months the asbestos cable insulation has had to be renewed periodically owing to its destruction by

heat. The lamps, however, continue to function, the caps, filling, contacts, &c., still being intact, in spite of vibration occasioned by the opening and closing of the doors, and of frequent blasts of cold air while the arc is in operation.

Mr. Savage, the electrical engineer, believes this to be the only example of the use of incandescent lamps inside arc projectors in cinemas.

Electrical Standardisation in America

The formation of a national committee of leading electrical technologists representing all leading branches of the electrical industry, the railways, and Government departments, to correlate the industrial standardisation work of the entire electrical industry in the United States and end the conflicts and administrative complications which have obstructed past standardisation activities, has been announced by the American Standards Association. The committee, organised at the request of the American Institute of Electrical Engineers, will serve both as the electrical committee of the American Standards Association and as the United States National Committee of the International Electro-technical Commission. In addition to supervising national electrical standardisation, it will act as the official American agency in international electrical standardisation. The scope of the committee's activities will include all classes of standards for electrical machinery, equipment, and materials employed in the production, distribution, and utilisation of electric power and for electrical communication.

Large High-voltage Reactors

The demand for high-voltage current-limiting reactors has resulted in the development of the oil-immersed type. The principal problem that had to be overcome was that of shielding the enclosing case from the effects of the magnetic field external to the windings. Large outdoor oil-immersed reactors recently built for American systems include several for neutral earthing on a 132-kV system. They are rated at 7,500 kVA for one minute and an "Autovalve" arrestor is connected across the terminals for by-passing surges. The largest oil-immersed reactors built to date are rated at 5,400 kVA continuous, on a 110-kV 60-cycle system, giving 28 per cent. reactance. The weight of these reactors is 36 tons each and the overall height 26 ft.

Illuminating Engineering Society Dinner

The annual dinner of the Illuminating Engineering Society will be held at the Trocadero Restaurant, Piccadilly, W., on February 9th (the anniversary of the foundation of the Society). Tickets (price 12s. 6d., exclusive of wine) may be obtained from the honorary secretary, Mr. J. S. Dow, 32, Victoria Street, S.W.1.

The First Three-phase Alternator

In our issue of October 2nd, on p. 501, we reported Prof. Elihu Thomson's address to Section G of the British Association. Our attention has been drawn, in a letter from Prof. Thomson's secretary, to the possibility of some misapprehension of the author's meaning in our condensed reference, in line 23 of the second column, to the machine from which the first three-phase alternator was evolved in 1882. The paragraph in question begins:—

"It was used to supply 20 arc lamps, five circuits of four in series."

The original paper states, "At first, four 20 ampère arcs in separate circuits were run from it. Within a few weeks these were put in series, and three of the four three-segment commutators were removed, leaving only one. . . . it was found that this original three-coil dynamo with its single commutator of three segments, the first of its type, would maintain readily a series of nine arc lamps in a circuit of ten webers (ampères) and without raising the speed of driving, which was about 900 revolutions per minute."

Ferranti Transformers in China

Memorials to Sun Yat Sen, the founder of the present Nationalist Government of China, are springing up all over that country, and the illustrations on p. 955 show a 150-kVA, 2,400-V, three-phase, 50-cycle Ferranti transformer supplied to the Kwang Tung Electric Supply Co., mounted temporarily for the purpose of lighting one of these memorials. Inside the building is an immense hall capable of seating 20,000 people and a large stage with the latest lighting devices, loud speakers, and dimmer-controlled lighting throughout the auditorium. The photographs were provided by Mr. A. H. Gordon, the Shanghai manager of Callender's Cable & Construction Co., Ltd.

Engineers and Education

There was a distinguished gathering of members and guests at the annual dinner and dance of the South Wales branch of the Association of Mining Electrical Engineers at Cardiff on December 19th. The branch chairman, Major W. Roberts, presided, and the company included the president of the Association, Major E. Ivor David, Mr. T. L. Mort, general manager of the Ebbw Vale Co., Ltd., Dr. C. A. Seyler, president South Wales Institute of Engineers, and Mr. J. Wayne Morgan, chairman Western Centre, I.E.E.

Replying to the toast of "The Association," proposed by Mr. T. L. Mort, Major David said they had heard a great deal recently about education, but with 50 per cent. of the colliery electricians of South Wales on a subsistance basis there was very little encouragement for men to give up their leisure and expend their energy on training themselves, when in the end all they got was a labourer's wage.

There was an appalling lack of engineering representation on the educational and governing bodies. He had not seen the name of one working engineer in the list of members of Parliament; yet engineers were supposed to be qualified to help and guide in the making of Acts of Parliament, in carrying them out, and in promoting technical efficiency.

It was noticeable that practically all the large successful companies in South Wales were definitely managed by engineers and had engineers on their boards of directors. Their Association differed from others inasmuch as it placed no bar on entrants. Its examinations and certificates were the hall mark of technical qualification in the field of mining electrical engineering.

Mr. J. B. J. Higham (branch vice-president) submitted "Kindred Associations and Guests," and in reply Dr. C. A. Seyler stressed the need for a wider recognition of the kinship of the many institutions associated with the engineering profession.

Legal

Overhead Lines: Compensation for Landowners

Mr. Justice Macnaghten, in the King's Bench Division on December 21st, gave his judgment in the action brought by the West Midlands Joint Electricity Authority, against the Willey Estates Co., Broseley, Shropshire, the Rev. C. S. Jackson, Broseley, Shropshire, Mr. J. Todd, Mill Hill, Brompton, Northallerton, Yorks, and Mr. W. J. Pitt, for a declaration that the Ministry of Transport, in giving its consent under Sect. 22, Electricity Act, 1919, to the placing of an electric line across any land, was entitled to give such consent subject to conditions as to the payment of wayleave. The defence was that the plaintiffs' action was *ultra vires* (ELECTRICAL REVIEW, December 4th and 18th).

His Lordship said that his opinion depended upon the construction of Section 22 of the Electricity Supply Act, 1919. Notices with terms and conditions were served upon Mr. Pitt, and under it Mr. Pitt might withdraw his consent to the placing of the lines across his land if he should require it for building or other purposes, when the Joint Electricity Authority would remove them at its own expense. During their continuance the Authority undertook to pay certain sums as wayleaves. Similar notices were served upon the other defendants. None of the owners consented.

An inquiry followed at which the owners were represented and argued that the case was one where compensation should be paid and assessed by the Official Arbitrator, and thereupon they took no further part in the proceedings. On May 30th the Minister consented to the proposal to place lines and towers across the land. The Minister contended that he acted by virtue of the powers conferred upon him, and reserved the right to review his decision in 1934.

But for the provisions of the Acquisition of Land Act the claim of the defendants would have been referred to and determined by an arbitrator nominated by the Minister. The defendants said that there was nothing in the Acts to affect their right to compensation. The Attorney-General did not dispute that it was land that was here taken and he admitted that it must be held that the Electricity Authority was a public authority within the meaning of the Act. Neither did he dispute the canon of construction put forward by the defandants and relied upon by them as to their rights in land.

THE MINISTER'S DUTIES

His Lordship said that the Electricity Act of 1919 did provide for compensation for the compulsory acquisition of land for wayleaves. It certainly was remarkable that the Legislature, if it was intended that the Minister should settle the compensation payable, should have refrained from saying so in express terms. A decision adverse to the Attorney-General could be drawn from the words in a section in the Telegraph Act of 1878. It was remarkable too that no allusion was made to the question of compensation. It could not be supposed that the Minister could assess the compensation. He would be obliged to delegate that to officials and there were objections to this.

In his Lordship's opinion the duties of the Minister were administrative and not quasi-judicial. He came to the conclusion that on the true construction of Sub-section 1 of Section 22 the assessment of compensation payable to the landowner was not within the province of the Minister of Transport. He thought that the words, "terms, conditions and stipulations" in the sub-section did not include pecuniary terms. It seemed to him that there were good grounds for thinking that it was within the power of an arbitrator to grant a rent for a wayleave or grant compensation.

He dismissed the plaintiffs' claim with costs and gave judgments for the defendants in the counter-claim for a declaration that in respect of wayleaves the compensation ought to be determined by arbitration under the Electricity Act of 1882 and the Acquisition of Land Act, 1919, with costs.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

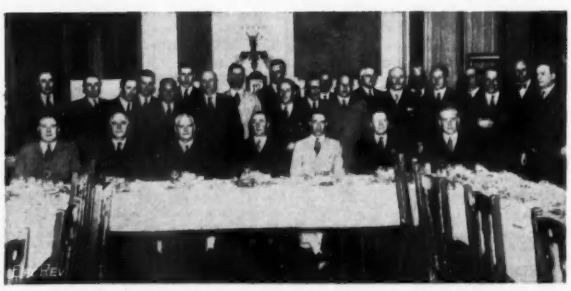
We shall be glad to learn the names and addresses of the makers of the following:—

TORCHIER system of indirect standard lighting.
Glass sticks for commutator cleaning.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. Arthur Clifton Kelly, M.I.E.E., A.M.Inst.C.E., was entertained to dinner on November 12th by members of the Institution of Electrical Engineers on the occasion of his retirement from the office of honorary secretary and treasurer to the Argentine Local Centre, in which capacity he has served for over fifteen years. Mr. Kelly visited the Argentine in 1909 with the object of drafting a report on surburban electrification for the Buenos Aires and Pacific Railway Co. On the termination of his investigations, he was requested to remain with the company as chief electrical engineer, which office he has since held, with the exception of an interval during the war when he served with the Royal



The dinner in Buenos Aires given to Mr. A. C. Kelly

Engineers in France and Russia, retiring with the rank of major. Mr. Ratcliffe Wright, the chairman of the local centre presided at the dinner, and others present were Messrs. W. Reece and A. Towers, directors of electricity supply companies, Messrs. K. Eckhard, L. Migotti, J. Wilson, and H. Sale, past chairmen of the centre, Mr. D. Nye, director of the local branch of the General Electric Co., engineers from the Central Argentine, Pacific, Western, Southern and Central Cordoba Railways, the B.T.H., Reyrolles, the English Electric, and Sturtevant companies, &c. Mr. Kelly was presented with a silver cigarette box by members of the Centre. The duties of local honorary secretary and treasurer of the Centre will be carried on by **Mr. R. G. Parrott,** past chairman of the Centre and local representative of the Metropolitan-Vickers Electrical Export Co. Mr. Kelly is the third from the left seated at the table in the accompanying photograph.

Sir Hugo Hirst, Bt., Chairman of the General Electric Co., Ltd., is a member of the reconstituted Empire Committee of the Federation of British Industries.

Mr. D. A. Bremner, of the British Engineers' Association, **Mr. I. V. Robinson,** of B.E.A.M.A., and **Mr. Edward Wilshaw,** Imperial and International Communications, Ltd., are also members of the Committee.

Dr. F. S. Sinnatt has been appointed Director of Fuel Research under the Department of Scientific and Industrial Research. Dr. Sinnatt has been Assistant Director of Fuel Research since 1924.

Mr. H. D. Vickery (chairman), **Mr. G. R. Hutchinson,** and **Mr. L. R. C. MacFarlane** have been appointed to the New Zealand Board of Control for wireless broadcasting.

Mr. Arthur Mansell is resigning his position with the Edison Swan Electric Co., Ltd., on January 1st in order to become a director and general manager of the Bective Electrical Co., Ltd. For some years Mr. Mansell held an executive position in the Illuminating Department of the British Thomson-Houston Co., Ltd., and, since the amalgamation, has been assistant to the manager of the "Royal Ediswan" Lamp Department.

We were glad to hear from Mr. Frank Parkinson, at the annual meeting of Crompton Parkinson, Ltd., held on Friday last, that there is a definite improvement in the condition of **Col. R. E. Crompton,** who is seriously ill.

Dr. M. G. Say has been awarded the Coopers Hill War Memorial Prize and Medal, which fell in 1931 to the Institution of Electrical Engineers, for his paper on "High-voltage Underground Cables."

Mr. D. Ross, of the Yorkshire Electric Power Co., has been appointed by the Dumfries County Council as deputy county electrical engineer and will take up his duties on December 28th.

Obituary

Mr. C. H. Julius.—The death occurred on December 15th of Mr. Charles Henri Julius, of London, a director of J. G. White & Co. Mr. Julius had been connected with many enterprises in South America and at the time of his death was director of the Para Electric Railways & Lighting Co., and the Manaos Tramways & Lighting Co. He had been a member of the Institution of Electrical Engineers since 1918.

Mr. P. Foley.—*The Times* reports the death at Nice on December 19th of Mr. Patrick Foley, a former director of the Eastern Telegraph Co. Mr. Foley was 66 years of age.

Mr. H. M. Taylor.—The death is reported of Mr. Harris Morton Taylor, engineer and manager to the Llanelly & District Electric Light Co. He was carrying out an inspection at the Gorseinon power station on December 21st when, it is thought, he stumbled and received a shock at 3,000 V.

High Frequencies for Industrial Purposes

THE application of the direct motor drive to the artificial silk and wood-working industries has rendered necessary the development of squirrel-cage induction motors operating at frequencies much higher than the normal 50 cycles per second.

In the artificial silk industry their use is chiefly for the individual drives of spinning pots and bobbins. The viscose and acetate processes are the two methods chiefly employed for the production of the yarn; with the former, "wet" spinning calls for spindle speeds of from 6,000 to 9,000 r.p.m., and with the latter method from 9,000 to 20,000 r.p.m.

The output of these motors is usually in the region of 0.1 h.p., and three-phase 80 V at the requisite frequency is becoming standard practice.

In the application of high-speed motors to wood-working machinery, the general trend of machine-tool design has been in the direction of utilising cutting tools directly driven by built-in motors; their advantages are the elimination of driving belts, with their troubles, and a cleaner outline of the machine. In order to obtain the requisite high cutting speeds, high-speed motors are necessary and the usual range of speeds is up to 7,200 r.p.m., entailing a 120-cycle supply. The use of "slip-in" stators and rotors mounted direct on the machine spindle is becoming standardised.

Two Methods Described

The available methods for obtaining the high-frequency supply are: (1) by a high-frequency alternator set, and (2) by an induction-type frequency convertor.

The first of these methods is usually employed only on large installations owing to its high first cost, but it may be rendered necessary in connection with spinning motors owing to the wave-form of the supply being of considerable importance.

The induction-type frequency convertor consists of a slip-ring motor, the stator of which is excited at normal frequency, whilst the rotor is driven in the reverse direction to that in which it would run as a motor. The frequency of the current induced in the rotor and taken from the slip-rings is the sum of the excitation frequency and that due to the speed of rotation, which is the product of the revs. per sec. and the number of pairs of poles of the machine.

The most usual arrangement is to couple the convertor directly to a driving motor, both machines being mounted on a combination bed-plate. With this scheme the output frequency will not, of course, correspond exactly to the synchronous speed owing to slip: the difference is, however, so small as to be negligible in practice. The ratio of the number of poles of the driving motor and frequency convertor is equal to the excitation frequency divided by the difference between the two frequencies.

The practice in Britain tends towards two-pole, and in America towards four-pole machines.

An output frequency of 125 per cent. of that of the excitation supply is stated to be the lowest frequency for which a convertor can be economically designed; below this, apart from the low efficiency, ventilation may present difficulties.

The output of an induction-type convertor is supplied not only by virtue of the rotation of the rotor, but also by the transformer effect between rotor and stator. The power required for the driving motor, neglecting losses, is equal to the product of power supplied electrically by the stator and the difference between the two frequencies over the output frequency. The power supplied electrically by the stator is the product of the output of the convertor and the excitation frequency over the output frequency.

The Control System

The control gear for a convertor of the type under discussion, should be designed so that it is impossible to close the excitation circuit of the convertor before the driving motor is started up, or, alternatively, to shut down the driving motor with the excitation circuit closed. Otherwise, with the rotor circuit completed through any connected load, the convertor itself would run up as a motor in the reversed direction and might attain a destructive speed.

Interlocking is usually accomplished by the interconnection of auxiliary contacts on the motor starter, with the no-volt release of the circuit breaker controlling the excitation supply. An additional precaution sometimes adopted is the use of an overspeed switch, centrifugally operated, connected to trip the appropriate circuit-breaker.

A. G. POWELL.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

United Telephone Cables, Ltd.—Private company. Registered December 19th. Nominal capital £1,000 in £1 shares. Objects: To carry on the business of manufacturers of telephone, telegraph, submarine and other cables and wires for electrical purposes, electrical engineers and contractors, manufacturers of electrical apparatus, &c. The subscribers are: G. L. Addison and D. Lawson, both of 2, Bond Court, Walbrook, E.C.4. The first directors are to be appointed by the subscribers. Not more than one of the directors for the time being in office (exclusive of alternate directors) may be a foreigner. No allotment of shares shall at any time be made which would cause more than 25 per cent. of the issued capital or voting powers to be held by foreigners or foreign corporations or their nominees. Secretary: J. H. Roberts. Registered office: Cable Research House, Silver Street, W.C.1.

British Electric Domestic Appliances, Ltd.—Private company. Registered December 19th. Capital £2,000 in £1 shares. Objects: To manufacture, import, export and deal in vacuum cleaners, electric irons, radiators, hair-driers, &c., and to carry on the business of electrical and mechanical engineers, electricians, battery makers, &c. The subscribers are: Mona Wheeler, 16, Felday Road, Lewisham, S.E.13, and W. J. Jackson, 3, Trinity Grove, Greenwich, S.E.10. Secretary: Mona Wheeler. Registered office: 4, Broad Street Place, E.C.2.

Wire Agency, Ltd.—Private company. Registered December 15th. Capital £100 in £1 shares. Objects:—To carry on the business of manufacturers of and dealers in wires of every description, manufacturers of metals, metal goods, and electrical apparatus, electricians, &c. The subscribers are:—J. O. Stacey, 2 and 3, Norfolk Street, W.C.2; and E. S. Holloway, 2, Wood Close, Kingsbury, N.W.9. Registered office: 2, Norfolk Street, Strand, W.C.2.

Marston Engineering Co., Ltd.—Private company. Registered December 15th. Capital £2,000 in 10s. shares. Objects:—To acquire the business of a general engineer and manufacturer of engines for industrial electric lighting, marine and other purposes carried on by J. M. Sibbald as liquidator of Record Corporation, Ltd., at Tutbury, Staffs; and to carry on the business of motor engineers, manufacturers of and dealers in motor cars, &c. The first directors are:—R. C. E. Thompson, "Briar Dene," Littleover Lane, Derby; and Annabel D. Thompson, "Briar Dene," Littleover Lane, Derby. Secretary: Annabel D. Thompson. Registered office: Scropton Lane Engineering Works, Tutbury, Staffs.

Cardiff Wireless Co., Ltd.—Private company. Registered December 17th. Capital £100 in £1 shares. Objects:—To carry on the business of manufacturers of and dealers in wireless and electrical apparatus, &c. The directors are:—Mrs. M. Howell and D. W. Howell, both of 13, Corporation Road, Cardiff. Solicitors: D. J. Davies & Son, 67, Queen Street, Cardiff.

Multi Relays, Ltd.—Private company. Registered December 17th. Capital £3,000 in £1 shares. Objects:—To carry on the business of manufacturers of and dealers in wireless receiving and transmitting apparatus, component parts, &c. The first directors are:—W. Graham, 27, Sefton Street, Brierfield, W. Roberts, Craigmore, Blacko; and J. C. Wareing, 7, Parkside Road, Nelson. Secretary: J. C. Wareing. Registered office: The Queen's Cinema, Nelson.

Electrical & Auto Products (1931), Ltd.—Private company. Registered December 16th. Capital £500 in £1 shares. Objects:—To carry on the business of electrical, wireless, motor, mechanical or other engineers or manufacturers, &c. The directors are:—A. J. Waring, 12, Robert Street, Cheetham, Manchester; and Mrs. L. Runbaken, "Maryvale," Hill Top, Wilmslow. Secretary: Dorothy Head. Registered office: 3, Camp Street, Deansgate, Manchester.

Wolverhampton Radio Installation Co., Ltd.—Private company. Registered December 15th. Capital £500 in £1 shares. Objects:—To carry on the business of manufacturers of and dealers in radio and electrical goods and apparatus, &c. The first directors are:—G. Talbot, 177, Lea Road, Wolverhampton; and E. Leach, "Algier," Oxburn Avenue, Wolverhampton. Secretary: F. Talbot, 177, Lea Road, Wolverhampton. Registered office: 56, Victoria Street, Wolverhampton.

Southern Counties Radio, Ltd.—Private company. Registered December 10th. Capital, £6,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio, electrical, magnetic, and other appliances, machines and apparatus, &c. The directors are: R. de Ste. Croix, 109, Victor Road, College Park, N.W.10, and F. O. Tosswill, Dunkery, Bryanstone Avenue, Guildford, Surrey. Secretary: R. D. Brown, Mount Pleasant Cottage, Portsmouth Road, Guildford.

Broadcast Listeners' Service, Ltd.—Private company. Registered December 12th. Capital, £1,000 in 800 10 per cent. cumulative preference shares of £1 and 4,000 ordinary shares of 1s. each. Objects: To establish and maintain wireless receiving and other stations, &c. The directors are: D. W. Heightman, 17A, Little Park Street, Wellingborough, and E. H. Stonehouse, 95, The Drive, Swanpool, Wellingborough. Registered office: 344, Salisbury House, London Wall, E.C.2.

"Raifleeta" Illuminating & Flood-lighting Co., Ltd.—Public company. Registered December 11th. Capital, £10,000 in 14,000 8 per cent. cumulative preferred shares of 10s. each and 60,000 deferred shares of 1s. each. Objects: To acquire the business of manufacturers of "Raifixa" lamps and lamps of all kinds carried on by A. V. L. Dennys and H. F. Grinstead at 139, Oxford Street, W., as the "Raifixa Lamp & Equipment Co."; to adopt an agreement with E. A. Concessions, Ltd. The first directors are: J. E. Burgess, 12, Denmark Avenue, Wimbledon, S.W.19, and A. Boulting, Hotel Victoria, Northumberland Avenue, W.C.2. Secretary: A. Planner.

Neon Rays, Ltd.—Private company. Registered December 14th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers of, agents for, and dealers in all kinds of electrical and mechanical advertising devices, illuminated signs, projecting cinematograph and talking picture apparatus, gramophones, recording and synchronising machines, &c. The subscribers are: S. C. Newton, "Compton," Pendennis Road, Streatham, S.W.16; E. J. T. Goudie, 29, Palace Gate, W.8; and five others. Secretary: E. J. T. Goudie, who signs documents as director. Registered office: 15, Whitcombe Street, W.C.2.

Aural Appliances, Ltd.—Private company. Registered December 12th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, exporters and importers of and dealers in aural appliances and aids to the deaf; scientific goods and apparatus, electric batteries and microphones, &c. The subscribers are: P. O. Goldsmith, 58, Teignmouth Road, Brondesbury, N.W.2, and A. R. Read, 123, Wigmore Street, W.1. P. O. Goldsmith is permanent director. Registered office: 60, Poland Street, W.1.

Returns of Electrical Companies

Ellis & Mort, Ltd.—Capital, £12,000 in £1 shares. Return dated August 28th, 1931. All shares taken up. £7,120 paid. £4,880 considered as paid. Mortgages and charges, nil.

Costa Rica Electric Light & Traction Co., Ltd.—Capital, £130,000 in £1 shares. Return dated September 8th, 1931. All shares taken up. £7 paid. £129,993 considered as paid. Mortgages and charges, £254,400.

Wood & Co. (Ipswich), Ltd.—Capital, £3,500 in 1,000 preference and 2,350 ordinary shares of £1 and 3,000 founders' shares of 1s. each. Return dated August 29th, 1931. All shares taken up. £3,350 paid on the preference and ordinary shares. £150 considered as paid on the founders' shares. Mortgages and charges, nil.

General Electric Co., Ltd.—Satisfaction to the extent of £35,000 on or before November 10th, 1931, of 5 per cent. mortgage debenture stock authorised September 11th, 1930, and secured by trust deed dated October 14th, 1930, and registered October 21st, 1930. (According to the register of mortgages, the trust deed registered October 21st, 1930, originally secured £3,500,000 debenture stock and contingent premium of 5 per cent.)

Beeches Radio & Electrical Co., Ltd.—Mortgage debenture dated November 17th, 1931, to secure £1,037, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. M. Smith, 19, Stafford Road, Waddon.

Associated Wireless Co., Ltd.—W. A. J. Osborne, of Balfour House, Finsbury Pavement, E.C.2, ceased to act as receiver and manager on December 2nd.

Coventry Electrical & Radio Services, Ltd.—Particulars filed of £1,000 debentures authorised December 11th, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £400.

Vincent Switchgear Manufacturing Co., Ltd.—Capital £10,000 in £1 shares. Return dated September 10th, 1931. 7,948 shares taken up. £7,948 considered as paid. Mortgages and charges, nil.

Wilkinson, Bentley & Co., Ltd.—Capital £3,000 in £1 shares. Return dated September 22nd, 1931. 1,850 shares taken up. £1,850 paid. Mortgages and charges, nil.

Ellis & Ward, Ltd.—Capital £10,000 in 2,000 preference and 8,000 ordinary shares of £1. Return dated September 16th, 1931. 1,000 preference and 6,003 ordinary shares taken up. £1,003 paid. £6,000 considered as paid. Mortgages and charges, nil.

Killamarsh & District Electric Supply Co., Ltd.—Capital £6,000 in £1 shares. Return dated September 14th, 1931. 3,630 shares taken up. £3,630 paid. Mortgages and charges, nil.

Wardle Engineering Co., Ltd.—Capital £25,000 in 10,000 preference and 15,000 ordinary shares of £1. Return dated October 28th, 1931. 5,765 preference and 8,429 ordinary shares taken up. £13,994 paid. £200 considered as paid. Mortgages and charges, £4,000.

English Cable Supplies, Ltd.—Capital £2,500 in £1 shares. Return dated October 12th, 1931. 1,052 shares taken up. £1,502 paid. Mortgages and charges, nil.

Yorkshire Cable Co., Ltd.—R. H. B. Heap, 32, Market Street, Bradford, ceased to act as receiver and manager on December 31st, 1925 (notice filed December 10th).

Newfields, Ltd.—W. W. Warnes, 59, Church Road, S.E.19, ceased to act as receiver and manager on December 11th, 1930. (Notice filed December 9th.)

Hoover, Ltd.—Charge on freehold land and building at Western Avenue, Perivale, Greenford, dated November 25th, to secure all moneys due or to become due from the company to the Westminster Bank, Ltd.

Oriental Telephone and Electric Co., Ltd.—Satisfaction to the extent of £2,130 on December 8th, of debenture stock secured by trust deed dated June 28th, 1905, and supplemental deed of acknowledgment dated June 12th, 1907, and registered July 11th, 1905, and June 20th, 1907, respectively.

City Notes

Crompton Parkinson, Ltd., held their annual meeting on December 18th, Mr. F. Parkinson (chairman) presiding. In presenting the report and accounts (ELEC. REV., December 18th, p. 937) the chairman said that although the profits for the period under review were lower, as compared with the preceding year, there had been no change of policy or falling-off in the efficiency of the organisation. They had passed through a period during which the pressure on their manufacturing facilities had been relieved, and they had used that period to direct the energies of the *personnel* and the resources of their equipment to the improvement and extension of their range of manufactures. The period had been one of increasing difficulty owing to the decline in purchasing power both at home and abroad, but in spite of intense competition they had not only maintained, but increased their share of the trade available. Considerable progress had been made in the design and manufacture of railway equipment, and some important orders were now in course of manufacture at Chelmsford. Regarding the acquisition of the British non-combine lamp works, which took place just before the last annual meeting, they had been actively engaged in the extension and development of this side of their business, which was now assuming substantial proportions. Notwithstanding an optimistic manufacturing programme and a conservative sales campaign, their works had been overwhelmed with orders, and it was only by working at high pressure that they had been able to meet the demand and at the same time maintain and improve the quality of the product. They were continuing the expansion and improvement of their equipment so as to be able to meet the increasing demand which all evidence showed would be forthcoming. With regard to the future they had a larger order-book to-day than at any time during the previous fifteen months, and the outlook was not without promise. The report and accounts were adopted.

The Anglo-Argentine Tramways Co., Ltd., held the adjourned meeting of the 5 per cent. debenture stockholders last week, the Duke of Atholl (chairman) presiding. In the course of his address the chairman said that the scheme of arrangement had been examined by a body of stockholders who had recommended certain amendments. Since 1928 there had been a rapid fall in the volume of traffic handled, consequent upon the depressed state of business in Argentina; the receipts had declined by £277,280 as compared with 1929, and the number of passengers carried by 33,500,000. For the current year, on the basis of known results, it was estimated that 463,000,000 passengers would be carried, a decrease of 59,000,000 as compared with 1930, the corresponding fall in the gross receipts being £490,835. The total decrease in traffic receipts since 1928 had been no less than £855,000, and the loss on exchange £440,000. The whole of the company's liquid reserves had been absorbed by special measures adopted to counteract the competition of omnibuses. It was this insufficiency of cash and the need to meet certain accumulated debts that had led to the scheme now submitted. The scheme, as amended, was approved.

Agricultural and General Engineers, Ltd.—A circular letter has been addressed to shareholders of the company stating that on October 27th last a memorandum was addressed to the board requesting an immediate investigation into the affairs of the company by Sir Gilbert Garnsey. This request was declined by the board, who, however, authorised the chairman to invite another accountant to advise with them on the affairs of the company. In the opinion of the signatories this does not provide for an independent and complete investigation into the past and present conduct of the business. They state that they are actively engaged in the business and some are directors of the three most successful firms in the group (Blackstone & Co., Barford & Perkins, Ltd., and Aveling & Porter, Ltd). They maintain that the profits of these have never reached the shareholders in the form of dividends because they have been swallowed up by the heavy expenses of the company and of the unsuccessful firms in the group. They therefore consider that a complete investigation, with its consequent recommendations, should be carried out without delay.

Stewarts & Lloyds, Ltd., have made an offer for shares of the Scottish Tube Co. The proposal is that they shall acquire the preference and ordinary capital of the Scottish company on the following terms:—For each 5 per cent. cumulative preference share in the Scottish Tube Co., there will be issued one 5 per cent. cumulative preference share in Stewarts & Lloyds, and for each six Scottish Tube ordinary shares there will be issued five deferred shares of Stewarts & Lloyds. The offer is conditional on 90 per cent. of the Scottish Tube shareholders of each class accepting. If, however, less than 90 per cent., but not less than 75 per cent. of each class accept, and special resolutions are passed putting the Scottish Tube Co. into voluntary liquidation, and providing for the purchase by Stewarts & Lloyds of the company's assets, Stewarts & Lloyds will carry the matter through. The directors of the Scottish Tube Co. have issued a circular to shareholders recommending the acceptance of the offer.

The Hydro-Electric Securities Corporation proposes to reduce its preferred capital stock from $20,000,000 to $10,062,000, and the common capital stock from $34,190,860 to $7,381,965. The directors state that the greater part of the market depreciation in the value of the assets has taken place in the last few months. No dividend will be declared on the common stock for the final quarter of 1931, although the estimated ordinary income for this period would have permitted of a distribution of 25 cents per share. The International Holding and Investment Co. and the Société Anonyme de Placement have agreed to surrender to the company shares of class "B" cumulative participating preferred stock of a par value equal to the amount outstanding on their subscriptions to the common stock. The directors propose that the offer be accepted, and a meeting to consider the proposals is to be held in Montreal on January 8th.

The Shawinigan Water & Power Co. has declared a quarterly dividend on the common shares of 50 cents per share.

Low Temperature Carbonisation, Ltd., held its annual meeting on December 15th, Col. W. A. Bristow (chairman) presiding. In the course of his speech the chairman said that for the first time in their history they had had two works in full production of "Coalite" during the whole year, and had sold the largely increased outputs at an enhanced price. The output at Barugh and Askern had steadily increased, and during the past twelve months the process had attained record figures for regularity and efficiency, while the cost of operation had been brought down to the lowest figure yet reached. In addition, the quality of the "Coalite" and coal oils had steadily improved. They had already distilled nearly 500,000 tons of coal yielding over 300,000 tons of "Coalite" and more than 7,000,000 gallons of crude oil and spirit.

The Victoria Falls & Transvaal Power Co. has announced a dividend of 3 per cent. on the preference shares for the half-year ending December 31st, and a further 3 per cent. in respect of participating rights for the year ending December 31st, 1931. An interim dividend of 3 per cent. is to be paid on the ordinary shares on account of 1931. All dividends are the same as last year. For the quarter ended September 30th last the net earnings, before providing for British and South African taxation, were £332,324, as against £328,110 in the previous quarter.

The Metropolitan Electric Supply Co., Ltd., was to hold a meeting on December 24th, when a resolution was to be submitted authorising the capitalisation of £90,000 of the special reserve and apply it in paying up in full 90,000 ordinary shares to be allotted to existing shareholders in the proportion of one for every twenty-five held.

The Charing Cross Electricity Supply Co., Ltd., is to submit resolutions at a meeting on December 30th authorising an increase of £350,000 in the capital, and the capitalisation of £63,914 standing to the credit of the reserve of the West End undertakings and £93,151 standing to the credit of the City undertaking.

The London Electric Supply Corporation, Ltd.—At a meeting held on December 16th the shareholders passed a resolution increasing the company's capital by the creation of 150,000 ordinary shares of £1 each.

The Brompton and Kensington Electricity Supply Co., Ltd., has postponed the extraordinary general meeting, which was to have been held on December 17th, to consider the capitalisation of the free reserves, until December 31st.

The Shropshire, Worcestershire & Staffordshire Power Co. is holding an extraordinary meeting on December 30th to consider a resolution creating 625,000 £1 "B" ordinary shares, ranking *pari passu* with the existing "B" ordinary shares.

The Associated Telephone & Telegraph Co. has announced a dividend of $1 per share on the class "A" stock, together with an additional and participating dividend on class "A" stock of $0.50 per share.

Marconi's Wireless Telegraph Co., Ltd., announces that the dividend on the 7 per cent. cumulative participating preference shares in respect of the year ending December 31st will be paid on January 1st.

Telephone Rentals, Ltd., have announced an interim dividend of 5 per cent. per annum (same) on the ordinary shares.

Companies Struck Off the Register.

The names of the undermentioned companies have been struck off the Register and they are thereby dissolved:—

British Electrical Trust, Ltd.
Radio Clocks, Ltd.

Stocks and Shares

MONDAY EVENING.

STOCK Exchange markets do not expect to be busy in the week preceding Christmas Day. There is, however, a fair amount of what members call "bread-and-butter business" going on, although the necessity of making provision against the three-quarters of the year income taxation, which has to be faced in ten days' time, has a very noticeable effect in restraining investment. The banks say that many of their customers are keeping money in reserve against this and the other calls which January brings.

Foreign exchanges continue to move in a manner both erratic and volatile. Intimate reports as to the financial position of New York and other American cities are not flattering to American credit for the time being, nor is any great confidence professed in the situation as it has developed in France. The effect of these impressions is to confine money more closely to British securities, and to the shares in companies doing a home trade. The number of changes which have occurred in prices is, so far as electrical issues are concerned, comparatively small.

London Electricity Supply Shares

The Metropolitan Electric and the Charing Cross Companies have followed the example set by the Brompton and Kensington and the Chelsea Companies in their policy of distributing part of their reserves in the shape of fully paid shares to their proprietors. The Charing Cross shareholders are to meet on the 30th of this month in order to pass resolutions, the effect of which will be to capitalise the sum of £63,914 standing to the credit of the reserve account (West End undertaking), while £93,151 standing to the credit of the reserve account of the City undertaking is to be treated in the same way. The shares, as with those of the Metropolitan Electric and the other companies adopting this procedure, are to be distributed amongst shareholders of the various companies in proportion to their holdings. The prices of the shares in the companies concerned are unchanged, Metropolitans remaining at 38s. 9d., Charing Cross at 29s.

Provincial Electricity

In the Provincial group, Yorkshire Electrics are a little lower at 31s. 3d. The company has taken the enterprising step of

issuing a booklet, printed in English, French and German, giving particulars of the area over which the company works, together with the resources and facilities it is able to offer to customers. Scottish Power and Clyde Valleys are both 6d. easier. Newcastle ordinary receded to 23s. Amongst the gilt-edged stocks, a fall of 1½ in London & Home Counties 4½ per cent. debenture stock still leaves the price at 86, some 3½ points higher than the 4½ per cent. debenture stock of the Central Electricity Board. Victoria Falls and Transvaal Power has declared an interim dividend of 3 per cent. on the ordinary and 6 per cent. on the preference, the dividends being at the same rate as those of a year ago. The announcement caused a little disappointment, it being hoped that the ordinary dividend would be increased. The shares have fallen 1/6 to 55s. The company is making good progress, and the net earnings, £332,300, for the quarter ended September 30th last, showed an increase of £4,600 above those of the corresponding period in 1930.

Lord Reading has left England for a visit to the Palestine Electric Corporation, of which he is chairman.

Oxford Electric

The Oxford City Council, after prolonged negotiation, has decided to purchase for £400,000 the City undertaking of the Oxford Electricity Company. Instead of paying in bonds, as it was proposed might be desirable, the settlement is to be made in cash. The Oxford Electric Supply Company is one of those controlled by Edmundsons' Electricity Corporation, and the price of its ordinary shares has been standing for some time past in the neighbourhood of 25s., the 6 per cent. preference being quoted at their par value of 20s. Edmundsons' is one of the companies under the control of the Greater London and Counties Trust. Another of the Trust's companies is the Shropshire, Worcestershire & Staffordshire Electric Power Company—more shortly called in the Stock Exchange the "Three Counties." Shareholders are called to a meeting to be held on December 30th, to consider a resolution creating 625,000 £1 "B" ordinary shares ranking *pari passu* with the existing "B" ordinary. The company's 6 per cent. preference have been changing hands on the basis of 21s. 6d., and its 5½ per cent. first debenture stock, now carrying nearly six months' interest, is quoted at 102½.

Railway Stocks

Underground Electric ordinary shares have fallen 1s. to 19s., for which one of the reasons given in the market is the pressure to sell shares on behalf of deceased accounts. The company is expected, as stated here last week, to maintain the 8 per cent. per annum dividend previously paid on the shares, and, if this expectation is realised, the yield on the money at the present figure will be £8 8s. per cent., without making allowance for the dividend accrued in the present price. Metropolitan consolidated has receded a point to 37½ on doubts as to what the dividend is likely to be. Districts remain at 61½, and the Central London stocks lean to the dull side.

Amongst the tramway issues, London & Suburban Tractions 5 per cent. preference went back to 8s. 3d., a fall of 1/6, the shares changing hands down to 7s. 6d. The price of the ordinary is quoted nominally at 6d. to 2s., the last bargain officially marked being at 6¾d. a few days ago. The London United Tramways 5 per cent. preference have been dealt in this month at 3s. 6d. and thereabouts.

Manufacturing Companies

The feature of the market for manufacturing and equipment shares is the strength shown by the recently issued "Ekco" ordinary, which, offered at 5s., have risen to 12s. 6d. The £1 preference shares are quoted at 3s. discount.

The prices of manufacturing shares as a whole are disposed to be dull. The inclusion in the third list of anti-dumping articles of electrical fittings and accessories of the kind used in interior electric lighting systems failed to arouse fresh interest in shares of the companies particularly connected with this branch. General Electrics are a little easier at £2 2s. Associated Electrical Industries ordinary shares fell 6d. to 20s. 9d., and the newly issued shares, which were offered at a guinea, stand at 6d. discount. British Insulated ordinary have gone back to 2⅜, Siemens dropped to 20s., and Henley's to £5. Telegraph Constructions remain weak at 12½. Callender's and Enfields have been lowered to 50s. and 37s. 8d. respectively.

Cables and Wireless

Nothing has occurred to bring about any revival of hope to the market in Cables & Wireless stocks. The three issues of the combine are again lower, and for £100 of each class of stock not much more than £70 would have to be paid. Globe ordinary remain flat at 8; the 6 per cent. preference at 7 are ex dividend. Anglo-American deferred has fallen back to 22. American Telephone & Telegraph is 15 points down at 175, and Internationals at 12 are 1½ lower.

Dollar stocks show irregular movements. Shawinigans recovered 3½ to 31; Electrical Development of Ontario fell 5 to 120. Canadian General Electrics are 1 better at 64½; Brazilian Tractions ½ down at 13¼. Amongst foreign descriptions, Whitehall 7½ p.a. preference have receded to a guinea, and the market for the debentures is dull.

Iron and Steel

The iron and steel market is disappointing to holders of its shares. Babcock & Wilcox are ⅛ lower at 46s. 3d. Vickers keep very close to 8s.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES

	Nom.	Approx. Dividend. 1929.	1930.	Price, Dec. 21, 1931.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole		15	15	57/6	—	5 4 4
Brompton Ordinary		8½	8½	27/6	—	5 1 0
Central Electricity 4½% Deb.	Stock	—	4½	82½	—	5 9 1
Charing Cross Ordinary	1	8½	8½	29/–	—	4 16 7
Chelsea	1	8½	8½	26/–	—	5 7 8
City of London	1	10	10	35/–	—	5 14 3
Clyde Valley	1	8	8	30/9	—6d.	5 4 1
County of London	1	11	11	43/3	—	5 1 7
Edmundsons' 7% Pref.	1	7	7	23/6	—	5 19 2
Elec. Supply Corporation	1	11	11	41/3	—	5 6 6
Kensington Ordinary	1	8	8	29/–	—	4 16 7
Lancs. Light and Power	1	7	6½	25/–	—	5 4 0
London & Home Counties 4½% Deb.	Stock	—	—	86/–	—1½	5 4 8
London Electric	1	8½	9	33/–	—	5 9 1
Metropolitan	1	9	10	38/9	—	5 3 3
Midland Counties	1	6½	7	26/3	—	5 6 8
Mid. Elec. Power	1	15	8	28/9	—	5 11 4
Newcastle-on-Tyne Ordinary	1	6	6	23/3	—6d.	5 3 3
Do. 7% Pref.	1	7	7	26/–	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10½	—	5 14 3
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	1	8	8	29/–	—	4 16 7
Scottish Power	1	8	8	27/–	—6d.	5 18 6
South London	1	8½	8½	25/6	—	5 9 8
Urban Ordinary	1	7	7	27/–	—	5 3 8
Westminster Ordinary	1	8½	8½	28/–	—	5 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/–	—1/6	7 2 10
Yorkshire Elec.	1	8	8	31/3	—9d.	5 2 5

HOME RAILS

Central London Ord. Assented	Stock	4	4	68½	—	5 16 10
Metropolitan	,,	4	3½	37½	—1	9 6 8
Do. District	,,	5	5	61½	—	8 2 8
Underground Electric	1	8	8	19/–	—1/–	8 8 6

TELEGRAPHS AND TELEPHONES

Anglo-Am. Tel. Pref.	Stock	6	6	92½	—	6 9 9
Do. Def.	,,	1½	1½	22	—½	6 16 4
Cables & Wireless 5½% Pref.	Stock	5½	5½	45½	—4½	—
Do. A 7½% Ord.	,,	Nil	—	15½	—2	—
Do. B Ord.	,,	Nil	—	10	—1	—
Globe Tel. and T. Ord.	10	10	8½	8	—	—
Do. do. Pref.	10	6	6	7½xd	—2/9	8 5 6
Great Northern Tel.	10	20	20	20½	—	9 15 2
Marconi-Marine	1	15	15	33/9	—	8 17 5
Oriental Telephone Ord.	1	12	12	2½	—	*5 13 0

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	5½	—	6/3	—	—
Do. do. 2nd Pref.	5	6	—	6/3	—	—
Do. do. 5% Deb.	Stock	5	5	12½	—	—
British Electric Traction Def. Ord.	,,	5	5	700	—50	—
Do. do. Pref. Ord.	,,	8	8	115	—	6 19 2
Brazil Traction	100	8	—	13¼	—¼	—
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	88	—1	5 13 8
London & Sub. Trac. 5% Pref.	1	Nil	Nil	8/3	—⅛	—
London United Tram Deb.	Stock	4	4	57½	—	6 19 2
Mexico Trams, 5% Bonds	—	5	5	35	+4½	14 5 8
Mexican Light Common	100	Nil	Nil	20	—	—
Do. 7% Pref.	100	7	7	25	—	20 0 0
Do. 1st Bonds	—	5	5	62	—	8 1 4
Victoria Falls Ord.	1	15	15	55/–	—⅛	5 9 1
Yorkshire (West Riding)	1	Nil	Nil	6/3	—	—

MANUFACTURING COMPANIES

Assoc. Elec. Ord.	1	6	6	20/9	—6d.	5 15 8
Do. Pref.	1	8	8	27/6	—	5 16 5
Babcock & Wilcox	1	15	14	46/3	—⅛	*6 2 0
British Aluminium Ord.	1	10	10	25/–	—	8 0 0
British Insulated Ord.	1	15	15	2⅜	—¼	5 14 3
Brush Ord.	Stock	10	5	70	—	7 2 10
Callender's	1	15	15	2½	—⅛	6 0 0
Do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord.	5/–	30	30	20/9	—	7 4 7
Do. 8% Pref.	1	8	8	27/6	—	5 16 5
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	91½	—	5 9 3
Electric Construction	1	5	Nil	10/–	—	—
Enfield Cable Ord.	1	25	25	3¾	—⅛	6 8 10
English Electric	1	Nil	Nil	7/6	—	—
Do. do. Pref.	1	Nil	Nil	7/6	—	—
Ferranti Pref.	1	7	7	21/3	—	6 11 9
G.E.C. Pref.	1	6½	6½	23/–xd	—6d.	5 13 1
Do. Ord.	1	14	10	42/–	—6d.	4 15 3
Henley's	1	30	30	5	—⅛	6 0 0
Do. 4½% Pref.	5	4½	4½	4	—	5 12 6
India-Rubber	1	Nil	Nil	6/3	—	—
Johnson & Phillips	1	10	10	23/9	—	8 8 5
Siemens Ord.	1	7½	7½	20/–	—/–	7 10 0
Telegraph Construction	12	10	7½	12½	—	7 4 0

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1930

15,334. "Application of bias to an electrode of a thermionic valve." British Thomson-Houston Co., Ltd., and D. McDonald. May 19th, 1930. (361,834.)

15,677. "High-voltage mercury arrester." R. Mitsuda. May 23rd, 1929. (361,835.)

18,791. "Electric protective arrangements." F. J. Lane, C. G. Mayo, P. Mathews and British Thomson-Houston Co., Ltd. June 19th, 1930. (361,934.)

19,156. "Electrical indicator systems." A. G. S. Barnard. June 24th, 1930. (361,838.)

20,188. "Arc rupturing arrangements for electric circuit-breakers." Etablissements Merlin Gérin Soc. Anon. July 9th, 1929. (361,985.)

21,879. "X-ray apparatus." O. H. Pieper. July 19th, 1930. (361,855.)

22,227. "Electromagnetic interrupters, impulse devices, or the like." Siemens & General Electric Railway Signal Co., Ltd., H. J. N. Riddle and J. E. Candler. July 23rd, 1930. (361,891.)

22,815. "Electric resistances." Igranic Electric Co., Ltd., and A. H. Curtis. April 29th, 1931. (361,986.)

24,488. "Electric cable telegraph systems." Electrical Research Products, Inc. August 19th, 1929. (Addition to 346,434.) (361,840.)

24,716. "Trunk communicating submarine cable with multiple wires." Siemens & Halske Akt.-Ges. September 24th, 1929. (361,843.)

24,900. "Electric vaporisers." H. Weiss. August 20th, 1930. (361,895.)

25,032. "Radio receiving circuits." Lissen, Ltd. (in liquidation), and M. V. Callendar. August 21st, 1930. (361,848.)

25,066. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., C. Gillings and F. T. Belas. August 21st, 1930. (361,849.)

25,073. "High-speed electric motors." Allgemeine Elektricitats-Ges. August 22nd, 1929. (361,850.)

25,094. "Interlocking electric switch-sockets." J. A. Crabtree and B. G. Harrison. August 22nd, 1930. (361,851.)

25,118. "Electric high-tension lead-in insulator." Porzellanfabrik P. Rosenthal & Co., Akt.-Ges. April 12th, 1930. (361,852.)

25,392. "Thermionic valves." W. R. Bullimore. August 25th, 1930. (361,867.)

25,454. "Thermionic valve circuits." British Thomson-Houston Co., Ltd., T. H. Kinman and G. S. C. Lucas. August 26th, 1930. (361,958.)

25,499. "Means for converting light variations into electric current or potential variations." L. Mellersh-Jackson (Siemens & Halske Akt.-Ges.). August 26th, 1930. (361,899.)

25,560. "Electric circuit-breakers." A. Reyrolle & Co., Ltd., F. Coates and A. Allan. August 27th, 1930. (Cognate application 16,277/31.) (361,924.)

25,574. "Electric heating body." L. Mellersh-Jackson (Siemens Planiawerke Akt.-Ges für Kohlefabrikate). August 27th, 1930. (361,960.)

25,589. "Switching arrangements for automatic telephone systems." Telefonaktiebolaget L. M. Ericsson. August 28th, 1929. (361,927.)

25,710. "Diaphragms permeable to electric current." Anode Rubber Co., Ltd. September 16th, 1929. (361,965.)

25,768. "Electric resistances." E. M. Newman, C. D. Barklie and Microfuses, Ltd. August 28th, 1930. (361,967.)

25,905. "Electro-acoustic converting devices, such as loud-speakers." Electrical Research Products, Inc. September 28th, 1929. (361,976.)

25,962. "Radio receiving and transmitting systems and apparatus." Graham Amplion, Ltd., and A. D. Hodgson. August 30th, 1930. (361,979.)

26,272. "Condenser microphones." General Electric Co., Ltd., and D. A. Oliver. September 3rd, 1930. (361,988.)

26,300. "Chemical receivers for telegraphic pictures." Siemens & Halske Akt.-Ges. September 18th, 1929. (361,989.)

26,349. "Impulse senders of the dial type for use in telephone systems." Automatic Telephone Manufacturing Co., Ltd., and T. P. Priest. September 3rd, 1930. (361,995.)

26,359. "Wireless receiving and transmitting apparatus, specially applicable to direction finding." W. B. MacKenzie, C. E. Horton and C. Crampton. September 3rd, 1930. (361,996.)

26,404. "Heat fuse especially for electric heating apparatus, such as boilers and the like." P. A. Jud. September 4th, 1930. (362,000.)

26,430. "Remote control device for radio receiving sets." Kolster-Brandes, Ltd. October 16th, 1929. (362,001.)

26,545. "Means for damping the oscillations of overhead electric lines." Siemens-Schuckertwerke Akt.-Ges. March 22nd, 1930. (362,004.)

26,888. "Starting of continuous current motors." Akt.-Ges. Brown, Boveri et Cie. September 16th, 1929. (362,009.)

27,181. "Apparatus for and method of producing high ohmic resistances and the like coated bodies." Dr. G. Seibt. April 3rd, 1930. (362,020.)

27,205. "Electromagnetic direction indicators, particularly for motor vehicles." R. Heinemann. January 27th, 1930. (362,024.)

27,225. "Apparatus for use with the electric iron." M. O. Twynam. September 12th, 1930. (362,026.)

27,323. "Telephone systems." Telefonaktiebolaget L. M. Ericsson. September 13th, 1929. (362,029.)

27,349. "Carrier wave television systems." Gramophone Co., Ltd., and A. Whitaker. September 12th, 1930. (362,030.)

27,515. "Electric adaptors and the like." W. Dabscheck. September 15th, 1930. (362,033.)

27,890. "Distributor for telegraphy or the like." Standard Telephones & Cables, Ltd., and E. K. Sandeman. September 18th, 1930. (362,044.)

28,190. "Loaded submarine electric cables." W. W. Triggs (Felten & Guilleaume Carlswerk Akt.-Ges. September 20th, 1930. (362,049.)

28,306. "Microphones." British Thomson-Houston Co., Ltd., A. Bowen and N. P. Hinton. September 22nd, 1930. (362,053.)

28,437. "Radio apparatus." Sparks-Withington Co. October 30th, 1929. (362,056.)

28,484. "Signalling systems." Siemens Bros. & Co., Ltd., D. A. Christian and W. T. Vosper. September 23rd, 1930. (362,058.)

29,572. "Microphones." Associated Sound Film Industries, Ltd. October 2nd, 1929. (362,072.)

30,011. "Super-heterodyne radio receiving apparatus." General Electric Co., Ltd., and N. R. Bligh. October 7th, 1930. (362,075.)

30,263. "Display signs with electric discharge lamps." General Electric Co., Ltd., and J. W. Ryde. October 9th, 1930. (362,082.)

30,584. "Electron tubes." A. A. Thorton (Radiowerke E. Schrack Akt.-Ges.). October 13th, 1930. (362,086.)

30,782. "Automatic telephone systems." Siemens Bros. & Co., Ltd., and D. A. Christian. October 15th, 1930. (362,088.)

31,160. "Electromagnets." N. Hall. October 17th, 1930. (362,094.)

31,379. "Automatic circuit-breaker with testing devices for electric circuits." P. Maisch. October 20th, 1930. (362,098.)

32,676. "Tapped electrical components." Gramophone Co., Ltd., and G. F. Clark. October 30th, 1930. (362,109.)

33,122. "Apparatus for controlling electric circuits." Chance Bros. & Co., Ltd., and J. H. Abbink-Spaink. November 4th, 1930. (362,116.)

33,167. "Electric train lighting systems." C. Lorenz Akt.-Ges. November 8th, 1929. (362,117.)

33,567. "Electrical storage batteries." Young Accumulator Co. (1929), Ltd., and R. S. Harborne. November 7th, 1930. (362,120.)

34,586. "Electrical induction furnaces." L. Dreyfus and Allmanna Svenska Elektriska Aktiebolaget. November 17th, 1930. (362,134.)

34,632. "Submarine electric cables." W. W. Triggs (Felten and Guilleaume Carlswerk Akt.-Ges.). November 17th, 1930. (Addition to 362,049.) (362,136.)

35,135. "Method of and means for evacuating and filling electric condensers with impregnating substances." Siemens-Schuckertwerke Akt.-Ges. November 27th, 1929. (362,143.)

35,179. "Electric transmission of images." Gramophone Co., Ltd., and C. O. Browne. November 21st, 1930. (362,144.)

35,448. "Insulated crossings for use in overhead trolley lines of trolley vehicles, railways, tramways, and like systems." A. T. Lambert. November 25th, 1930. (362,145.)

36,000. "Apparatus for converting electric power." British Thomson-Houston Co., Ltd. November 29th, 1929. (362,150.)

36,578. "Quick action electric switches." R. W. Jolly and British Electric Meters, Ltd. December 4th. 1930. (362,158.)

37,572. "Electrical band pass filters." Marconi's Wireless Telegraph Co., Ltd. December 12th, 1929. (362,170.)

37,658. "Electric current regulators." Westinghouse Electric and Manufacturing Co. December 20th, 1929. (362,171.)

38,355. "Air break electric switches." Associated Electrical Industries, Ltd. December 19th, 1929. (362,180.)

38,739. "High voltage electric discharge rectifier having an incandescent cathode." C. H. F. Muller Akt.-Ges. December 24th, 1929. (362,184.)

39,100. "Apparatus for the electrolytic deposition of metals." Soc. Anon. Waldberg. December 27th, 1929. (362,191.)

39,166. "Means for suspending electric conductors." Callender's Cable & Construction Co., Ltd., and C. O. Boyse. December 30th, 1930. (362,192.)

1931

902. "Television apparatus." R. G. Wilson and H. E. Dall. January 10th, 1931. (362,208.)

1,738. "Construction of frame aerials for wireless reception." G. Gavoret. January 19th. 1931. (362,214.)

2,667. "Means for regulating the circulation of the electrolyte in pressure decomposers with a separate circulation of the anolyte and catholyte." A. Mentzel. January 27th, 1931. (362,219.)

2,807. "Mounting of coils in wireless apparatus." G. W. Melland. January 28th, 1931. (362,221.)

3,529. "Electric condensers." N. F. Edwards, G. V. Dowding and Amalgamated Press, Ltd. February 4th, 1931. (362,230.)

3,680. "Electric insulators." Hermsdorf-Schomburg-Isolatoren Ges. February 7th, 1930. (362,233.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 16th:—

Frigidaire. Nos. 514,176, 517,054 and 514,177. Classes 6, 18 & 50. Refrigerating machines, chambers and chests.—Frigidaire Corporation, Dayton, O., U.S.A. (British representatives: White, Langner, Stevens, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, W.C.).

Wardus (lettering and design). No. 525,351. Class 8. Radio-telephonic receiving sets and parts thereof.—Warnes & Dust, Ltd., 10, D'Arblay Street, W.1.

Homestead (lettering and design). No. 526,532. Class 13. Electric light and gas fittings.—Baxendale & Co., Ltd., 41, Miller Street, Manchester.

Daimona (lettering and design). No. 518,365. Class 13. Electric handlamps, electric incandescent lamps (ordinary), and cases of ordinary metal for electric handlamps.—Elektrotechnische Fabrik Schmidt & Co., Berlin. (British representatives: Boult, Wade & Tennant, 112, Hatton Garden, E.C.1.)

Yunos. No. 523,945. Class 50. Insulating parts of electrical fittings made of condensation products of phenol and formaldehyde.—B. Sacov, trading as the Universal Electric Lamp Co., 89, Great Eastern Street, E.C.2.

Britmac. No. 526,586. Class 50. Phenol-formaldehyde condensation products, casein and similar electric insulating materials, &c.—C. H. Parsons, Ltd., Wharfdale Road, Tyseley, Birmingham.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aylesbury (BUCKS).—Bazaar premises, High Street, for F. W. Woolworth & Co., Ltd., Kingsway, London.

Barnes (SURREY).—Maisonettes (150) for the U.D.C.; surveyor.

Bexhill-on-Sea.—Alterations to Lindores School, Wrestwood Road; E. Bunce.

Blackpool.—Branch premises, Preston Old Road, for the Co-operative Society, Ltd., Sheppard Street; architects' department.

Blaydon-on-Tyne.—Housing scheme, Winlaton, for the U.D.C.; Mr. Masthilo, surveyor, Council Offices.

Bolton.—Houses, Top-o'-th'-Brow (800) and Johnson Fold (376); housing director to the Corporation, Old Hall Street North.

Bournemouth.—Alterations and additions, Wesleyan church, Queen's Road; trustees. Site development, Old Christchurch Road, and Fir Vale Road; Rumsby & Rodd. Shops and flats, Tuckton Road and Southlea Avenue; A. H. Parks.

Bradford.—Employment exchange; H.M. Office of Works, King Charles Street, S.W.1.

Charlton Adam (YEOVIL).—Re-erection of Old Barton House, residence of H. C. Uniacke.

Chester-le-Street.—Houses (50) for the U.D.C.; Council's surveyor. Sewage disposal works, Plawsworth, for the R.D.C.; M. Wilson, surveyor, Union Offices.

Clarkston (LANARKSHIRE).—Development of Eastwoodmains Estate for residential purposes; Aberdeen Property Investment Building Society.

Cosham (HANTS).—Baptist church; trustees.

Coulsdon.—Alterations and additions, 6, 8 and 10, Chipstead Valley Road; E. R. Taylor.

Croydon.—Flats, Windmill Street (£5,115); borough engineer. Alterations and additions, 42-4, North End; Boots, Ltd., Nottingham. Shops, offices and flats, Purley Way; A. J. Caney, 3, Tokenhouse Buildings, Moorgate, E.C.2.

Drumchapel (GLASGOW).—Houses (24), Gt. Western Boulevard; J. Lawrence (Glasgow), Ltd.

Dundee.—Extensions to Dalgleish Nurses' Home (£5,300); medical superintendent.

Edinburgh.—New wing and modernising old buildings at Chalmers Hospital, Lauriston Place (X-ray rooms and electric heating), £13,000; medical superintendent. School, Restalrig Housing Estate, for the city E.C.; city architect. Conversion of station buildings into dwelling houses at Leith for the London and North Eastern Railway Co.; L.N.E.R. engineer. Extensions to Royal Infirmary; T. W. Turnbull, architect.

Evesham (WORCS).—Cinema (electrical work); H. Robinson, architect, Birmingham.

Exeter.—Houses (38), Burnthouse Estate, and aerodrome; city engineer.

Exwick (DEVON).—House (25), Foxhayes Estate; Exeter Workmen's Dwellings Co., Ltd.

Fenton (STAFFS).—Houses (44), Grove Road; E. W. Haynes.

Glasgow.—Houses (248), Nitshill Estate; housing director.

Glossop (DERBYSHIRE).—Post Office, Whitfield; W. Carnall.

Hertfordshire.—Casual ward extensions, St. Albans (£10,000); Saxon, Snell & Phillips, architects, 9, Bentinck Street, London, W. Science block, St. Audrey's School, Hatfield (£3,000), for the county E.C.; director of education, Hertford.

Holbeach (LINCS).—Houses (20) for the U.D.C.; surveyor.

Ipswich.—Aerodrome development; Brian, Lewis & Co., Ltd. Clearance scheme, Mount area; borough engineer. Junior school, Gainsborough Estate (£8,000), and school centre, Nacton Road (£2,360), for the E.C.

Isleworth.—Enlargement to the Green School (£26,480); W. S. Try, Uxbridge.

Kettering.—Houses (100), Pipers Hill Estate; U.D.C. surveyor. Alterations to Coliseum Theatre, Russell Street; Mr. Sherwood.

Kilmarnock.—Houses (50) for the T.C.; burgh surveyor.

Lanarkshire.—Houses (64), Newarthill and Harthill, for the C.C.; P. C. Smith, housing engineer, 13, Clydesdale Street, Hamilton.

Leicester.—Church for the trustees of St. Ann's Church Western Park (Vicar Rev. M. H. Marsland); A. F. Brain, architect, St. Martin's Chambers, 8, New Street.

Liverpool.—Orphanage at Woolton Road, Wavertree, for the Board of Management (£65,000); Barnish & Silcock, architects, 58, Rodney Street.

London.—(BERMONDSEY).—Flats, Rotherhithe Street, and shops (12), Odessa Street and Elgar Street; also reconstruction of depôt buildings, Neckinger Wharf (£36,346); B.C. Works Dept. Alterations, Convent of Mercy, Arnolds Place; Rev. Mother Superior. Buildings at Mark Brown's Wharf, Potters Fields; Hays Wharf, Ltd. (CITY OF LONDON).—Rebuilding of St. Michael's House, Cornhill, for Barclays Bank, Ltd.: W. Campbell Jones. Rebuilding of *The Times* offices; *The Times* Printing Co. (HACKNEY).—Buildings, Clapton Stadium, Millfields Road; Wallis, Gilbert & Partners. (HAMPSTEAD).—Buildings, Finchley Road, Barrand Street and Ingham Street; Morris Estates, Ltd. (HOLBORN).—Rebuilding of Prudential Offices, Holborn Bar; Prudential Assurance Co. (ST. MARYLEBONE).—Buildings, Abbey Road and Grove End Road; Western Heritable Trust, Ltd. (POPLAR).—Presbytery, St. Mary's Church, Canton Street; W. C. Morgan. (ST. PANCRAS).—Extensions to London Temperance Hospital, Hampstead Road; governors. Extensions to Royal Veterinary College, College Grove; governors. (SHOREDITCH).—Sunlight clinic, Kingsland Road; medical officer of health. (STEPNEY).—Extensions to Johnson St. Catholic School (280 places); Rev. Canon Ring. (STRAND).—Buildings for Duchy of Lancaster, Lancaster Place; W. & E. Hunt. (WESTMINSTER).—Rebuilding of 24, Old Bond Street; E. V. Harris.

Lowestoft.—School, Kirkley Run (£6,555); borough engineer.

Merton and Morden.—Parish church of St. Peter, at corner of Middleton and Bishopsford Roads (£13,000); Woolridge and Simpson, contractors, Oxford.

Middlesbrough.—Conversion of Marton House to sanatorium; borough engineer.

Middlesex.—Elementary school, Long Lane, Hillingdon; county architect.

Newbury.—Alterations and additions to 1, Bridge Street; National Provincial Bank, Ltd.

Newcastle-on-Tyne.—Shops (12), Kenton Lane; Bewley & Scott, builders, Dunston-on-Tyne.

Newport (I.O.W.).—Joinery works, Trafalgar Road, for H. W. Morey & Sons.

North Riding.—School, Eston; secretary, County E.C., Northallerton.

Oxford.—Houses (60), Quarryfields site, for the T.C.; S. E. Moss & Son, builders, St. Fabian's Drive, Chelmsford. Rebuilding business stores, Carfax, for Wyatt & Sons.

Paisley.—Houses; D. Stevens Lane, New Sneddon Street.

Portland.—Cinema, Masonic Hall; J. O. Hayes.

Riccall (YORK).—Housing scheme, Barlby; R.D.C. surveyor.

Sheffield.—Sorting office; H.M. Office of Works, King Charles Street, S.W.1.

Southport.—Re-erection of Becconsall Hotel, Hesketh Bank, for Ellis, Warde & Co., Ormskirk (£15,000).

Stoke-on-Trent.—Six blocks of flats, Abbey Hulton; Sutton trustees.

Stranraer.—Houses (32) for the T.C.; burgh surveyor.

Stratford-on-Avon.—Alterations, &c., Alveston Manor, for E. Smithin; G. E. Boshier, architect, 18, Bridge Street.

Surrey.—School centre, Mortlake School (£2,200); county architect.

Swanscombe (KENT).—Alterations, Electric Cinema; T. Arthur.

Swansea.—Additions to cinema, Neath Road, Landore; W. Hyman.

Taunton.—Housing scheme (18 acres), Wedlands, for the T.C.; borough surveyor.

Thornaby-on-Tees.—Extensions to Pumphrey & Co.'s mills; Kitchen & Co., architects, 21, Albert Road, Middlesbrough.

Wakefield.—Extensions to the Rutland Mills, Tootall Street, for Patons and Baldwins, Ltd.; Newbold & Hartley, architects, 4, Crown Court.

Wednesbury (STAFFS).—Houses (172), Park Lane site, for the T.C.; borough surveyor. Houses (58), for the T.C.; McKeand Smith & Co., Ltd., and B. Denning, builder.

Wembley.—Secondary school, Carlton Avenue (£44,990); W. J. Dickens, Ealing, W.

Weston-super-Mare.—Houses (54), for the U.D.C.; H. A. Brown, surveyor.

Weymouth.—Bandstand and enclosure (£20,000), for the T.C.; borough surveyor.

Natal Sugar Estate Power Scheme

MR. JOHN ROBERTS, borough electrical engineer of Durban, South Africa, has submitted to the Town Council a scheme for the increased production of electricity in the Natal sugar estates for use both as power and for irrigation purposes. He has also recommended that the first installation of plant be made at one sugar mill by April, 1933, and that Mr. C. Dawson, the Corporation power station superintendent, be instructed to visit London as soon as possible to confer with Messrs. Merz and McLellan, the Council's consulting engineers, on the most suitable design for such a plant. The proposals have been referred to the Electricity Committee.

Mr. Roberts's proposal is to install in the sugar factories modern high-pressure steam-electric plants. These would also feed the municipal supply system at those periods of the year when the demands of the factories were particularly low, and be used for pumping water to irrigate the lands. In this way Mr. Roberts contends that the output of cane per acre can be increased, or, alternatively, the existing output can be obtained from a much reduced acreage at a correspondingly lower cost of production. He quotes figures which show that the cost of working 500 acres by electricity, over two years, would be £906, as compared with £1,430 if crude-oil power were used. It is, he says, only a question of time before a high-voltage electric power supply line will be erected through the sugar district along the Natal coast. Mills producing sugar in excess of, say, 10,000 tons a year will have their steam plants designed to take full advantage of the generation of electricity and will feed their surplus power into this line.

Estimating that the total crop of cane will be 250,000 tons for the 1931-2 season, Mr. Roberts assumes that if efficient steam-electric plant were installed in the mills to utilise half the cane for that tonnage, then the total amount of electricity which could be generated, on a basis of 670 kWh per ton of sugar, would be 84,000,000 kWh. Of this, 270 kWh per ton would be required for factory use, equal to 33,700,000 kWh, leaving a surplus of 400 kWh per ton, equal to 54,000,000, for irrigation or delivery back to the supply system.

Mr. Roberts points out that the present output of the Durban Corporation system is 100,000,000 kWh per annum. This gives an indication of the magnitude of the electrical development which is possible on the sugar estates, especially as the figures given are based on the employment of electricity in milling only half the present crop.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
ARROW Switchgear, wiring devices ...	Arrow Electric Switches, Ltd., 79, Gt. Queen St., Kingsway, W.C.2.
ARTIC Pressure contact self-aligning fuse gear, electro-velocity circle-glow electric fires, anti-vibration electric light fittings	Artic Fuse & Electrical Mnfg. Co., Ltd., Birtley, Co. Durham.
ARTOFEX Electric ovens for bakers and flour confectioners	Artofex Eng. Works, Ltd., 6-8, Pentonville Rd., N.1.
ASEA Single, two- and three-phase a.c. motors and generators, direct current motors and dynamos, transformers	Asea Electric, Ltd., 5, Chancery Lane, W.C.2.
ASHDOWN Bakelite mouldings of every description	H. E. Ashdown (Birmingham), Ltd., Perry Barr, Birmingham.
A.T.M. IN CIRCLE Telephone, telegraph, and signalling equipment	Automatic Telephone Mfg. Co., Ltd., Strowger Works, Milton Rd., Edge Lane, Liverpool.
AUSTINLITE Automatic generating and pumping gear, &c.	Austinlite, Ltd., Lighthouse Works, Smethwick, Birmingham.
AUTONOFF Time switch	Venner Time Switches, Ltd., Kingston By-Pass Rd., New Malden, Surrey.
AVERY Automatic boiler scales, automatic weighers and totalisers, automatic coal weighers	W. & T. Avery, Ltd., Soho Foundry, Birmingham.
AVERY Automatic weighers for steam condensate, automatic weighers, all types of weighing, counting, testing and mixing machines	W. & T. Avery, Ltd., Soho Foundry, Birmingham.
AVOMETER Electrical measuring instrument ...	The Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, Douglas St., S.W.1.
BAA Accumulator acid	F. W. Berk & Co., Ltd., 106, Fenchurch St., E.C.3.
BAKELAQUE Insulating material	Attwater & Sons, Hopwood St. Mills, Preston.
BAKELITE Moulding materials, laminated sheets, varnishes, &c.	Bakelite, Ltd., 68, Victoria St., S.W.1.
BAKELITE Synthetic resins, cement, silent gear material, &c.	Bakelite, Ltd., 68, Victoria St., S.W.1.
BAKELITE Insulating varnish	Attwater & Sons, Hopwood St. Mills, Preston.
BAKELITE Mouldings and insulating material	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
BAKELITE Mouldings and insulating materials	The Brownie Wireless Co. of Great Britain, Ltd., Nelson St. Works, Mornington Crescent, N.W.1.
BAKELITE Mouldings and insulating materials	Thomas de la Rue & Co., Ltd., Shernhall St., Walthamstow, E.17.
BALLSOK Admiralty pattern insulating beads	Lionel Robinson & Co., 3, Staple Inn, W.C.1.
BANDY Electric fans	Berkeley & Young, Ltd., Tyseley, Birmingham.
BARDISK Electric bell indicators, motor vehicle indicators, road traffic signals	S. Taylor & Sons, 38a, St. Martin's Lane, W.C.2.
BATTERSEA Carbon brushes	Morgan Crucible Co., Ltd., Battersea Works, Church Rd., S.W.11.
BATWIN Small motors	Power Contracts (Batwin), Ltd., 138, Southwark St., S.E.1.
B.C.M./A.T.M. Telephone and telegraph equipment, electric heating and cooking appliances, mine signalling apparatus	Automatic Telephone Mfg. Co., Ltd., Strowger Works, Milton Rd., Edge Lane, Liverpool.
BEANCO Switches	Baxendale & Co., Ltd., Miller St., Manchester.
BEANCO Dry cells	Baxendale & Co., Ltd., Miller St., Manchester.
BEANCO Lampholders	Baxendale & Co., Ltd., Miller St., Manchester.
B.E.C. Motors, starting gear, controllers ...	British Electric Co., 25-29, Lower Rd., Rotherhithe, S.E.16.
B.E.L.L. Decorative and special types, including Maxtrip, Candelux, Opalux, signal lamps,	British Electric Lamps, Ltd., Spencer Hill Rd., S.W.19.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
BELLEROID Insulators	Barrett & Elers, Ltd., Dace Rd., E.3.
B.E.M. Motors	Brittain's Electric Motor Co., formerly Langdon-Davies Elec. Motor Co., Eastdown Works, Dermody Rd., Lewisham, S.E.13.
BERGMANN Fans, motors, cables	The Bergmann Electric Co., Ltd., 82, Victoria St., S.W.1.
BERRY Transformers	British Electric Transformer Co., Ltd., Hayes, Middlesex.
BERRYL Radiator	Berry's Electric (1928), Ltd., 85-6, Newman St., W.1.
BIMETAL Non-oxidising, non-arcing fuse wire	Parmiter, Hope & Sugden, Ltd., Fluvent Electrical Works, Vernon St., Longsight, Manchester.
BIRKA Automatic "Super-Smoothwell" irons	Premier Electric Heaters, Ltd., Keeley St. and St. Andrew's Rd., Birmingham.
BIRLEC Electric resistance furnaces for all types of heat treatment and automatic temperature control equipment	Birmingham Electric Furnaces, Ltd., 55, George St., Parade, Birmingham.
BLACKFRIARS Adhesive tape	Spicers, Ltd., 19, New Bridge St., E.C.4.
BLACKLEY Tape	Connolly's (Blackley), Ltd., Blackley, Manchester.
BLACO Steel conduit fittings	F. C. Blackwell & Co., Ltd., Great Crosby, Liverpool.
BLAIZOLITE Adjustable patent projector lantern	Norrington & Landon, Ltd., 33, Brazennose St., Manchester.
BLAKE Insulated staples	Mosses & Mitchell, Ltd., Chiswell Works, 60-64, Ironmonger Row, E.C.1.
BLUE LABEL Dry cell	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
BONDIT Special bonded wiring system and fittings	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
BOREAS Air compressors, vacuum pumps, pneumatic equipment	Lacy-Hulbert & Co., Ltd., Boreas Works, Beddington, Croydon.
BOTRADE I.C. switches and distribution boards	S. Bill & Co., Ltd., Queen's Rd., Aston, Birmingham.
BRIGHTRAY Nickel-chromium resistance wires and tapes for elements in electric furnaces, fires, &c.	Henry Wiggin & Co., Ltd., Wiggin St., Birmingham.
BRITANNIA Stationary lead accumulators for all purposes, accumulators for electric vehicles, motor-car and motor-cycle starting and lighting batteries	Britannia Batteries, Ltd., Britannia House, 233, Shaftesbury Avenue, W.C.2.
BRITMAC Electrical accessories	C. H. Parsons, Ltd., Britannia Works, Tyseley, Birmingham.
BRITTAIN Motors	Brittain's Electric Motor Co., formerly Langdon-Davies Elec. Motor Co., Eastdown Works, Dermody Rd., Lewisham, S.E.13.
BRUCE Street lighting lantern	The Wardle Engg. Co., Ltd., Elsinore Rd., Old Trafford, Manchester.
BRUSH Tramcars, tramcar trucks, motor-'bus bodies	The Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough.
BRUSH Transformers, motors and generators, liquid starters	The Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough.
BRUSH-LJUNGSTROM Steam turbo-generators	The Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough.
B.T.H. Electrical equipment	British Thomson-Houston Co., Ltd., Rugby.
BULL Motors and dynamos	Bull Motors, Ltd., Ipswich, England.
BUSY BEE Refrigerator	Drake & Gorham Wholesale, Ltd., 77, Long Acre, W.C.2.
BUSY BEE Vacuum cleaner	Drake & Gorham Wholesale, Ltd., 77, Long Acre, W.C.2.
B & Y Electric fans and small motors ...	Berkeley & Young, Ltd., Tyseley, Birmingham.
CABLEGRIP Cable boxes	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
CAB-TYRE Electric cables	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
CAB TYRE Cab tire sheathed wires and cables of all types	St. Helens Cable & Rubber Co., Ltd., Slough.
CAB TYRE Electrical cables	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
CAB TYRE Cab-tire sheathed wires and cables of all types	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
CAB TYRE Cab-tyre sheathed cables and wires	Siemens Bros. & Co., Ltd., Woolwich, S.E.18.
CABTYRIT Corrosion-resisting rubber	St. Helens Cable & Rubber Co., Ltd., Slough.
CADURO Cadmium copper wire for trolley and transmission purposes	Richard Johnson & Nephew, Ltd., Bradford Iron Works, Manchester.
CALLENDER Feeder and transformer pillars, joint box compounds, disconnecting joint boxes	Callender's Cable & Construction Co., Ltd., Hamilton House, E.C.4.
CALLENDER Electric cables of all types	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
CAMBRIDGE Instruments	Cambridge Instrument Co., Ltd., 45, Grosvenor Place, S.W.1.
CANVARY Electric water heater	Berry's Electric, Ltd., 85-6, Newman St., W.1.
CARRON Fires, domestic and heavy cooking appliances, irons, &c.	Carron Company, Carron, Falkirk.
CASTLE Dynamos, motors, switchgear ...	J. H. Holmes & Co., Ltd., North Drive, Hebburn-on-Tyne.
CECIL Resistances, dimmers for theatres and cinemas, battery charging apparatus	Mansell & Ogan, Ltd., 15-16, Floral St., Covent Garden W.C.2.
CELEC Sliding resistances, dimmers, cinema resistances, and charging boards	Curtis Mfg. Co., Ltd., Conduit Place, W.2.
CENTURY Single-phase repulsion induction motors, two- and three-phase automatic start motors, fractional h.p. split phase motors	Asea Electric, Ltd., 5, Chancery Lane, W.C.2.
CENTURY D.c. volt-ammeter test set ...	Elliott Bros. (London), Ltd., Century Works, Lewisham, S.E.13.
C. & H. Electricity meters and instrument transformers	Chamberlain & Hookham, Ltd., Solar Works, New Bartholomew St., Birmingham.
C.H. Hand-operated and self-acting electric motor controlling apparatus and wireless components	Igranic Electric Co., Ltd., 149, Queen Victoria St., E.C.4.
CHANGE COIL Multi-range electrical testing set ...	Record Electrical Co., Ltd., Broadheath, Altrincham, Cheshire.
CHROMALOX Electric heating units	Geo. Bray & Co., Ltd., Leeds.
CIRSCALE Electrical measuring instruments ...	Record Electrical Co., Ltd., Broadheath, Altrincham, Cheshire.
CITY Motors, a.c. and d.c.	City Electrical Co., 1, Emerald St., W.C.1.
CLARITONE Loudspeakers and headphones ...	Automatic Telephone Mfg. Co., Ltd., Milton Rd., Edge Lane, Liverpool.
CLASSIC Pulpit, lectern, piano, organ and piano fittings	The Lodge Fittings Co., Ltd., 57, Albert Rd., Aston, Birmingham.
CLEMATEITE Arc-proof asbestos sheets and mouldings	Dacier, Ltd., 8, 10 & 12, Wagner St., Old Kent Rd., S.E.15.
CLIFTEX Insulating tape	Mosses & Mitchell, Ltd., Chiswell Works, 60-64, Ironmonger Row, E.C.1.
COFFIELD Washing machines	White Tile Heaters, Ltd., Clementhorpe Works, off Charlton St., York.
COLECTRIC A system of heating combining central heating with electricity for topping up	Berry's Electric (1928), Ltd., 85-86, Newman St., Oxford St., W.1.
COLUMBUS Automatic staircase time-lag switches	Elkay Electrical Manufacturing Co., Ltd., 4, Southampton Row, W.C.1.
CONCORD Wires and cables	Concordia Electric Wire Co., Ltd., Trent Mills, New Sawley, near Nottingham.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
CONRADTYS Carbons, arc lighting and medical	Sloan Elecl. Co., Ltd., 8-12, Golden Lane, E.C.1.
CONRADTYS Carbon brushes	Sloan Elecl. Co., Ltd., 8-12, Golden Lane, E.C.1.
CONSTELLARAY Floodlight fittings	Central Electrical Engineers' Assoc., Supply, Ltd., 193, Bethnal Green Rd., E.2.
COSMOS Lamps	Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.
COSYGLO Imitation coal fires	Automatic Telephone Mfg. Co., Ltd., Strowger Works, Milton Rd., Edge Lane, Liverpool.
COUNTESS Electric fires	Premier Electric Heaters, Ltd., Premier Works, St. Andrew's Rd., Birmingham.
CRABTREE (Regd.) Switches, accessories and switchgear	J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall.
CRACORE Twin and three-core solid bitumen cables, cab tire sheathed trailing cables	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
CREDA Electric cooking, heating and water heating appliances	Credenda Conduits Co., Ltd., Oldbury, Birmingham.
CRESSALL Resistance nets, regulators, sliding resistances, steel jacketed unit heaters	Cressall Mfg. Co., Eclipse Works, 31 & 32, Tower St., Birmingham.
CROYDON High-grade fractional h.p. electric motors	The Croydon Engg. Co., Ltd., 80, Gloucester Rd., Croydon.
CRYPTO Generators and motors (a.c. and d.c.), constant potential equipments, commutating rectifiers, cinema arc sets, &c.	The Crypto Electrical Co., Ltd., Acton Lane, Willesden, London, N.W.10, associated with The Lancashire Dynamo & Motor Co., Ltd., Trafford Park, Manchester.
CRYSELCO Electric lamps	Cryselco, Ltd., Kempston Works, Bedford.
C.T.S. Electrical cables	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
C.T.S. Cab tyre sheathed wires and cables of all types	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
C.T.S. Cab-tire sheathed wires and cables	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
C.T.S. Cab tyre sheathed cables and wires	Siemens Bros. & Co., Ltd., Woolwich, S.E.18.
CUMULUS Electric water heaters	Nathan & Allen, Ltd., 25, Victoria St., London, S.W.1.
DAGENHAM Metal sheathed surface wiring system	The Union Cable Co., Ltd., Dagenham Dock, Essex.
DAMARDA Lacquer	Bakelite, Ltd., 68, Victoria St., S.W.1.
DAVENSET Commercial accumulator charging plants for A.C. Mains, static rectifiers, mains transformers, and power smoothing chokes	Partridge, Wilson & Co., Davenset Works, Evington Valley Rd., Leicester.
DAVIDSON Electric irons, fires, kettles and cookers	Berkeley & Young, Ltd., Tyseley, Birmingham.
DECO Patent limit switches, cable reeling drums, and special control devices for handling plants	Dalyte Electrical Co., Deco Engg. Works, West Row, N. Kensington, W.10.
DE LAVAL Centrifugal oil purifiers, non-aerating oil purifiers, high voltage oil testing sets.	Alfa-Laval Co., Ltd., 34, Grosvenor Rd., London, S.W.1.
DESCO Fuses, distribution gear and switchboards	G. P. Dennis, Ltd., 66, South John St., Liverpool.
DIAMOND H. Reciprocating heater switches, rotary switches, all types, temperature control apparatus	Hart Manufacturing Co., 76-76b, Rochester Row, S.W.1.
DIATRINE Diatrine paper-insulated cable ...	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
DICTOGRAPH Loud speaking intercommunicating and automatic telephone	Dictograph Telephones, Ltd., Abbey House, Westminster, S.W.1.
DOLPHIN Electric cookers, fires and other domestic electric appliances	Domestic Electrification, Ltd., Townsend House, Greycoat Place, Westminster, S.W.1.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
DOMINO Flat two-pin and two-pin "earth" extension connectors	A. P. Lundberg & Sons, Ltd., Pioneer Elecl. Wks., Paradise Passage, Sheringham Rd., N.7.
DOUGLAS Automatic coil winder	The Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, Douglas St., S.W.1.
DOWSING'S Electric heating and medical appliances	Dowsing Radiant Heat Co., Ltd., Bollo Lane, Acton, W.3, and 91-3, Baker St., W.1.
D.P. Storage batteries	The D.P. Battery Co., Ltd., Bakewell, Derbyshire.
DRAGOR High and low tension switchgear	Drake & Gorham, Ltd., Standard Rd., North Acton, N.W.10.
DRAKA Cables	Electric Cables, Ltd., 25, Old St., E.C.1.
DUDLO Enamelled wire	L.P.S. Electrical Co., Ltd., Ealing Rd., Alperton, Middlesex.
DUETTE All insulated fuseboards	Midland Elec. Manufacturing Co., Ltd., Barford St., Birmingham.
DUFLEX Control of pendulums in existing turret clocks	Gent & Co., Ltd., Faraday Works, Leicester.
DUGDILL'S Movable, focusing, self-sustaining electric lighting fittings	John Dugdill & Co., Ltd., Hazel Grove, near Stockport.
DULRAE Electric warming panels	Dulrae Manufacturing Co., Ltd., 4, Bloomsbury Place, W.C.1.
DUNDEE Adhesive protecting tape	William Geipel, Ltd., Vulcan Works, 156-170, Bermondsey St., S.E.1.
DUO-SAVELITE Double filament lamp	Philips Lamps, Ltd., 145, Charing Cross Rd., W.C.2.
DUPLEX Electric floor polisher, Portable electric sander, Appliances for hairdressers	Electrona Electrical Products, Ltd., Friday St., Manchester.
DUPLEX Two-way tumbler switch with "off" position	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
DUPLO Motor-car lamps	Philips Lamps, Ltd., Philips House, 145, Charing Cross Rd., W.C.2.
DUREX Electric wiring system for C.T.S. or L.C. cables	Simplex Conduits, Ltd., Garrison Lane, Birmingham.
DYNAMEG Testing sets and fault finders ...	Dynameg, Ltd., 41, Oriel Rd., Bootle, Liverpool.
E Switchgear and control gear, &c.	Geo. Ellison, Ltd., Perry Barr, Birmingham.
EBOLITE Standards, switches and wall-brackets, press-button design	S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.1.
EDGEWISE Narrow flush single-way, two-way, two-way and off, &c., switches	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
EDISWAN Dry batteries	The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
EDISWAN L.T. accumulators	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
EDISWAN Domestic appliances	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
EDISWAN Vacuum cleaners	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
EFCO Resistance furnaces for heat treatment of metals, pottery kilns, low-temperature pot furnaces for melting, &c.	Electric Resistance Furnace Co., Ltd., 17, Victoria St., S.W.1.
EFESCA Cookers, heaters, switches ...	Falk, Stadelmann & Co., Ltd., Efesca Electrical Works, 83-93, Farringdon Rd., E.C.1.
ELASTUMEN Cable	Johnson & Phillips, Ltd., Charlton, S.E.
ELECTRICOAL (HEATRAE) Imitation coal fires	Electric Fires, Ltd., Heatrae Works, Norwich.
ELECTRIC TRANSMISSION Transmission line accessories, bushings, pole top switchgear	Electric Transmission, Ltd., Culford Works, Kingsbury Rd., Islington, N.1.
ELECTROFLO Industrial instruments	Electroflo Meters Co., Ltd., Abbey Rd., Park Royal, N.W.10.
ELECTRO-VAPOUR Radiators	Benham & Sons, Ltd., 66, Wigmore St., W.1.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
ELEPHANTIDE Insulating pressboards	B. S. & W. Whiteley, Ltd., Pool-in-Wharfedale, Nr. Leeds.
ELGEE Electricity meters, time switches, and instrument transformers	Landis & Gyr, Ltd., Elgee Works, Victoria Rd., North Acton, W.3.
ELIMAFUSE Small circuit breakers for lighting, heating and power circuits	Industry & Commerce Alliance, Ltd., Aldwych House, Aldwych, W.C.2.
ELIMINAIR Feed water deaerator	Richardsons, Westgarth & Co., Ltd., Hartlepool.
ELIXUM Service cut-outs, service joint boxes, feeder pillars, &c.	Sykes & Dyson, Ltd., Queen's Mill Rd., Huddersfield.
ELLIOTT Electrical measuring instruments of all kinds	Elliott Bros. (London), Ltd., Century Works, Lewisham, S.E.13.
ELLISON Circuit breakers and switchgear ...	Geo. Ellison, Ltd., Perry Barr, Birmingham.
ELLISON Plastic insulating compound ...	Ellison Insulations, Ltd., Perry Barr, Birmingham.
ELLMAR Bakelite mouldings for insulating and all electrical requirements	The Ellmar Mouldings Co., Thimble Mill Lane, Birmingham.
ELMANCO Square universal house wiring box for lead-covered systems	Baxter & Caunter, Ltd., 219, Tottenham Court Rd., W.1.
ELMITE Circular moulded universal wiring box for use with C.T.S. cables	Baxter & Caunter, Ltd., 219, Tottenham Court Rd., W.1.
EMPIRE Insulating cloth and tape	Attwater & Sons, Hopwood Street Mills, Preston.
EMPIRE Insulating materials, insulating cloths, tapes, etc.	The Micanite & Insulators, Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
EMPIRE Silks, papers and tubes	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
ENA Electrical heating apparatus and elements	Ena Electrical Appliances, Ltd., Ena Works, 30, Church Rd., N.1.
ENDOLAC High grade black spirit insulating varnish for finishing coat on armatures and fields	Pinchin, Johnson & Co., Ltd., General Bldgs., Aldwych, W.C.2.
ENDURAL Special cables and compound ...	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
ENFIELD Cables	The Enfield Cable Works, Ltd., Lincoln House, 296-302, High Holborn, W.C.1.
ENSIGN Lampholders, wall plugs, &c. ...	General Accessories Co., Ltd., 18-22, Euston Buildings, George St., N.W.1.
E.P.S. Accumulators	Pritchett & Gold & E.P.S. Co., Ltd., 50, Grosvenor Gdns., S.W.1.
EQUATORIAL Cable	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
EQUILUXO A special type of glassware ...	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
ESLA Street-lighting "Bi-multi" reflectors	Electric Street Lighting Apparatus Co., The Foundry, Canterbury.
ESSELL Insulating varnished cloth, papers, tapes, &c.	Spicers, Ltd., 19, New Bridge St., E.C.4.
EUREKA Electric vacuum cleaners	Eureka Vacuum Cleaner Co., Ltd., 8, Fisher St., Southampton Row, W.C.1.
EVER READY Dry cells, batteries, and electric lamps (portable)	Ever Ready Co. (Great Britain), Ltd., Hercules Place, N.7.
EXALT Switches, switch-plugs, &c. ...	General Accessories Co., Ltd., 18-22, Euston Buildings, George St., N.W.1.
EXAUTO Time switch	Venner Time Switches, Ltd., Kingston By-Pass Rd., New Malden, Surrey.
EXPRESO Quick make-and-break switches and switch-plugs	General Accessories Co., Ltd., 18-22, Euston Buildings, George St., N.W.1.
FABROIL Non-metallic gears	British Thomson-Houston Co., Ltd., Rugby.
FAIRYLAND Lighting strip	Imperial Lighting Co. (Implitico), Ltd., 2-6, Pocock St., S.E.1.
F.A.P. Conduit and fittings and accessories	Fitter & Poulton, Ltd., Vincent Parade, Balsall Heath, Birmingham.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
FERRANTI Radio receivers	Ferranti, Ltd., Hollinwood, Lancs., and Bush House, W.C.2.
FERRANTI Radio components	Ferranti, Ltd., Hollinwood, Lancs., and Bush House, London, W.C.2.
FERRANTI Radiant fires	Ferranti, Ltd., Hollinwood, Lancs., and Bush House, London, W.C.2.
FERRANTI Water heaters	Ferranti, Ltd., Hollinwood, Lancs., and Bush House, London, W.C.2.
FERRANTI Switchboard instruments	Ferranti, Ltd., Hollinwood, Lancs., and Bush House, London, W.C.2.
FERRANTI Power transformers	Ferranti, Ltd., Hollinwood, Lancs., and Bush House, London, W.C.2.
FERRANTI Electricity meters	Ferranti, Ltd., Hollinwood, Lancs., and Bush House, London, W.C.2.
FERRY Low temperature-coefficient, nickel-copper resistance wires and tapes for motor starters, &c.	Henry Wiggin & Co., Ltd., Wiggin St., Birmingham.
FIBRE Insulating materials	Mosses & Mitchell, Ltd., Chiswell Works, 60-64, Ironmonger Row, E.C.1.
FIBRE Insulating sheet, rod and tube ...	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
FIREBERRY Magicoal fire	Berry's Electric (1928), Ltd., 85-86, Newman St., W.1.
FIREBLAZE Magicoal fire	Berry's Electric (1928), Ltd., 85-86, Newman St., Oxford St., W.1.
FIRIMINE Fuse switches	Berry's Electric (1928), Ltd., 85-86, Newman St., Oxford St., W.1.
FISH-SPINE Admiralty-pattern insulating beads	Taylor, Tunnicliff (Refractories), Ltd., 110, Cannon St., E.C.4.
FLEXOTUBE Insulated sleeving	John MacLennan & Co., 115, Newgate St., London, E.C.1.
FLUVENT Distribution fuse gear	Parmiter, Hope & Sugden, Ltd., Fluvent Electrical Works, Vernon St., Longsight, Manchester.
FORMALITE Moulding powders	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
FORMAPEX Insulating varnish, moulding mixtures, miocarta sheet and tubes (bakelite type)	The Ioco Rubber & Waterproofing Co., Ltd., Netherton Works, Anniesland, Glasgow, W.3.
FORMITE Bakelite moulding materials ...	Bakelite, Ltd., 68, Victoria St., S.W.1.
FOSTER Transformers and sub-station, &c.	Foster Engineering Co., Ltd., Apex Works, South Wimbledon, S.W.19.
FROUDE Dynamometers and wind tunnel testing plants	Heenan & Froude, Ltd., Worcester, England.
FULLER Transformers, single, two- and three-phase induction motors, motor starters	Fuller Elecl. & Mnfg. Co., Ltd., 5, Chancery Lane, W.C.2.
FULLOLITE Lamps	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
FULL O'POWER Dry batteries	Siemens Brothers & Co., Ltd., Woolwich, S.E.18.
FURSE Cinema curtain controllers and dimmers, organ and orchestra lifts	W. J. Furse & Co., Ltd., Traffic St., Nottingham.
GAMEWELL Fire alarm systems	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
GARBE LAHMEYER Motors, dynamos and transformers	Korting & Mathiesen, Elecl., Ltd., 711-715, Fulham Rd., S.W.6.
GARDY Rotary switches and fuses	Thompson & Co., 1 & 3, Old Swan Lane, E.C.4.
GECOFIX Electric light fittings of every description	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
GECOPHONE Wireless receiving sets, components and accessories	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
GECORAY Reflectors for shop-window lighting	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
GENACCO Electrical accessories	General Accessories Co., Ltd., 18-22, Euston Buildings, George St., N.W.1.
GENEX Electrical accessories	General Accessories Co., Ltd., 18-22, Euston Buildings, George St., N.W.1.
GENII Geysers, automatic storage water heaters, stills, radiators, thermostats, &c.	Geo. Nobbs, Ltd., 87-89, Cleveland St., Euston Rd., W.1.
GILSONITE Asphaltum, bitumen	Ashby, Morris, Ltd., 17, Laurence Pountney Lane, E.C.4.
GLASGOW-REX Ironclad switches	Midland Electric Mfg. Co., Ltd., M.E.M. Works, Barford St., Birmingham.
GLIMALAC For making up mica plates or materials commonly called micanite	Pinchin, Johnson & Co., Ltd., General Bldgs., Aldwych, W.C.2.
GLOBAR Non-metallic electric heating elements, resistors and electric furnaces	British Resistor Co., Ltd., Trafford Park, Manchester.
GLO-CLAD Watertight and gastight electric lighting system	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
GLOVERITE Insulated wires and cables for signalling and special situations	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
GLOVERS Electric wires, cables and lead rubber-covered house-wiring systems	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
GLOVOX Compound insulated mains cables	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
GLOWRAY Nickel - chromium - iron resistance wires and tapes for elements in electric irons, toasters, &c.	Henry Wiggin & Co., Ltd., Wiggin St., Birmingham.
GLYPTANITE Super micanite sheet	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
GOBLIN Electric suction cleaner	British Vacuum Cleaner & Engineering Co., Ltd., Parsons Green Lane, S.W.6.
GOTIT Interlocked switch plug taking B.E.S.A. standard plug	A. P. Lundberg & Sons, Ltd., Pioneer Elecl. Wks., Paradise Passage, Sheringham Rd., N.7.
GRAHAM Marine telephones, loud-speaking multiphones, helm and engine indicators, &c.	Alfred Graham & Co., Ltd., St. Andrew's Works, Slough, Bucks.
GRIP Jointing sleeves for electric cable conductors	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
GRIPTITE Adhesive tape	Spicers, Ltd., 19, New Bridge St., E.C.4.
G.W.B. Large mechanically-operated electric furnaces, tunnel kilns, &c.	G.W.B. Electric Furnaces, Ltd., Elecfurn Works, North Rd., N.7.
HAILWARE Glassware and lighting fittings ...	Hailwood & Ackroyd, Ltd., Beacon Works, Morley, Nr. Leeds.
HAMILTON BEACH Carpet washers and drink mixers	S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.1.
HART Electric accumulators	Hart Accumulator Co., Ltd., Marshgate Lane, E.15.
HAZEMEYER Switchgear, &c.	Alan Wright, 117, Victoria St., S.W.1.
HEATRAE Electric fires, water heaters, oil heaters	Electric Fires, Ltd., Heatrae Works, Norwich.
HEATRAE Immersion heaters, tubular heaters, small cookers, &c.	Electric Fires, Ltd., Heatrae Works, Norwich.
HEENAN Air coolers, water coolers and electric dynamometers	Heenan & Froude, Ltd., Worcester, England.
HELSBY Condensers for telephone, telegraph and power factor improvement	British Insulated Cables, Ltd., Prescot, Lancs.
HELSBY Cords (telephone and switchboard)	British Insulated Cables, Ltd., Prescot, Lancs.
HELSBY Rubber-insulated cables	British Insulated Cables, Ltd., Prescot, Lancs.
HELSBY Wiring systems	British Insulated Cables, Ltd., Prescot, Lancs.
HENLEX Special compound insulation ...	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
HENLEY Link or fuse disconnecting boxes ...	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HENLEY Distribution pillars	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HENLEY Tape	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HENLEY Cables of all types	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HENLEY Joint box compounds	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HENLEY Plywood backboards	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HENLEY WIRING SYSTEM Special wiring system and fittings	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HERCULACKER Automobile cables	Concordia Electric Wire Co., Ltd., Trent Mills, New Sawley, nr. Nottingham.
HERCULENE Electric cables	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HERMES Bare copper wire and strip, c.c. wire and strip	Rd. Johnson, Clapham & Morris, Ltd., St. Mary's Rd., Newton Heath, Manchester.
HEROULT Electric furnace, arc type for steel, cast-iron and nickel alloy melting	Electric Furnace Co., Ltd., 17, Victoria St., S.W.1.
HIGHLOW Electric cooking and heating apparatus, electric water heaters, electric oil heaters	Archibald Low & Sons, Ltd., Merkland Works, Partick, Glasgow, W.1.
HINGELESS Teak fuseboards (non-corrodible, detachable)	S. Bill & Co., Ltd., Queen's Road, Aston, Birmingham.
HITEST Cables	Falk, Stadelmann & Co., Ltd., Efesca Electrical Works, 83-93, Farringdon Rd., E.C.1.
HOFFMANN Ball and roller bearings, steel balls and rollers	Hoffmann Mfg. Co., Ltd., Chelmsford, Essex.
HOLDERS Repetition parts in brass or steel, metal stampings, electric towel rails, lampholders and fittings	Holders, Ltd., West Silvermills, Edinburgh.
HOLOPHANE Scientific lighting units	Holophane, Ltd., Elverton St., Vincent Sq., S.W.1.
HOMESTEAD Irons	Baxendale & Co., Ltd., Miller St., Manchester.
HOMESTEAD Fires	Baxendale & Co., Ltd., Miller St., Manchester.
HOT-POINT Electric irons, soldering irons and branders	Dowsing Radiant Heat Co., Ltd., Bollo Lane, Acton, W.3, and 91-3, Baker St., W.1.
HOTPOINT Domestic electric appliances ...	Hotpoint Electric Appliance Co., Ltd., 24, Newman St., Oxford St., W.1.
HOTPOINT-FALCO Electric cookers	Hotpoint Electric Appliance Co., Ltd., 24, Newman St., Oxford St., W.1.
H.W.S. Special wiring system and fittings...	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HYPER-SCALE Electrical measuring instruments ...	Nalder Bros. & Thompson, Ltd., 97a, Dalston Lane, E.8.
ICALL Hairdryers, violet-ray apparatus, electric equipment for hairdressers	I. Calvete, Ltd., 59-61, North St., Clapham, S.W.4.
IDEAL Electrical measuring instruments and relays of all types	Nalder Bros. & Thompson, Ltd., 97a, Dalston Lane, E.8.
IDELITE Bakelite tubes and rods	Bakelite, Ltd., 68, Victoria St., S.W.1.
I. & F. Controller fingers, contacts and colliery coal-cutter spares and renewals	Imeson & Finch, "Empress" Works, Stockton-on-Tees.
IGRANIC All types of electric motor starting and motor controlling apparatus and wireless components	Igranic Electric Co., Ltd., 149, Queen Victoria St., E.C.4.
IMP (Regd.) Flat tumbler switches and switch plugs	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
IMPERIAL Conduit tubes and accessories ...	Isaac Griffiths & Sons (Proprietors: James McDougall, Ltd.), Imperial Works, Wednesbury, Staffs.
IMPERIAL Electric stage equipment	Imperial Lighting Co. (Implitico), Ltd., 2-6, Pocock St., S.E.1.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
IMPREGNITE Black, solid, impregnating compound for treating all types of coils having a great depth of wire	Pinchin, Johnson & Co., Ltd., General Bldgs., Aldwych, W.C.2.
INFINITY Flexible lighting cords	Sloan Elecl. Co., Ltd., 8-12, Golden Lane, E.C.1.
INFINITY Insulated wires and cables	Sloan Elecl. Co., Ltd., 8-12, Golden Lane, E.C.1.
INKWELL Recording instruments	Everett, Edgcumbe & Co., Ltd., Colindale Works, Hendon, N.W.9.
INTERMEDIATE Tumbler switch for control of lamps from more than two positions	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
INVENTUM Fires, water heating and domestic appliances	Alan Wright, 117, Victoria St., S.W.1.
INVENTUM Electric fires, electric water taps, electric cisterns	W. C. Yuille & Co., Ltd., 12, Wellington St., Glasgow, C.2.
INVENTUM Electric fires	Inventum Electrical Appliances, Ltd., 117, Victoria St., S.W.1.
INVENTUM Electric water heaters	Inventum Electrical Appliances, Ltd., 117, Victoria St., S.W.1.
INVENTUM Radiators, water heaters, etc. ...	W. E. Beardsall & Co., Ltd., Victoria Bridge, Manchester.
IRONSAFE Switchboards	Berry's Electric (1928), Ltd., 85-86, Newman St., Oxford St., W.1.
ISCO Ironclad service cutouts	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
ISOLAC An acid and waterproof, air drying and baking insulating varnish of di-electric properties, and permanent plasticity	Pinchin, Johnson & Co., Ltd., General Bldgs., Aldwych, W.C.2.
JACELITE (Regd.) Moulded accessories	J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall.
JACKSON Electric cookers, fires, kettles, breakfast cookers, &c.	The Jackson Electric Stove Co., Ltd., 143, Sloane St., S.W.1.
J.L. Universal wiring clips for cables ...	Walter Balmford, M.I.E.S., "Electric House," 116, Steelhouse Lane, Birmingham.
J. & P. Wiring system	Johnson & Phillips, Ltd., Charlton, S.E.
JUBILEE Worm drive clips	L. Robinson & Co., "London Chambers," Gillingham, Kent.
KALANITE Insulating material	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
KALANOID Plastic waterproof compound ...	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
KALBITUM Anti-corrosive paint	The Anchor Cable Co., Ltd., Leigh, Lancs.
KALECORE Electric cables	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
KALEECO Wiring system	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
KALIBOND Lead-sheathed cable having special bonding wire	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
KANDEM Lighting fittings, arc lamps for all purposes, incandescent and arc equipment for film and photographic lighting	Korting & Mathiesen Electrical, Ltd., 711 and 715, Fulham Rd., S.W.6.
KANTARK Fuses, cut-outs and distribution boards	Midland Electric Mfg. Co., Ltd., M.E.M. Works, Barford St., Birmingham.
KATHANODE Storage batteries	The D.P. Battery Co., Ltd., Bakewell, Derbyshire.
KELDON Unit lighting fittings	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
KERSON Electrical accessories	The Kersons Mnfg. Co., Ltd., 36, Wainwright St., Aston, Birmingham.
KEY FIBRE CONDUIT Conduit for underground cables and bird guards	Key Engineering Co., Ltd., 4, Queen Victoria St., E.C.4.
KILARC (Regd.) Positive action quick make and break tumbler switches	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
KINARKO Carbons for cinematograph work, &c.	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
KINGSNORTH Joint box compounds, electrical filling compounds, sleeve compounds	Berry, Wiggins & Co., Ltd., Tensulam House, Water Lane, Stratford, E.15.
KINGSWAY Combined switch and plug ...	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
KLYMAX Single and two-way narrow-panel tumbler switches	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
KONFORM Switch plug	Berry's Electric (1928), Ltd., 85-86, Newman St., Oxford St., W.1.
KWIKWIRE Lampholders, tumbler switches and ceiling roses	J. H. Tucker & Co., Ltd., King's Rd., Tyseley, Birmingham.
KYE Electric lamps	The British Elec. Transformer Co., Ltd. (Sunray Tricity Dept.), Wellington House, 125-130, Strand, W.C.2.
LAMBERT Water heaters	White Tile Heaters, Ltd., Clementhorpe Works, off Charlton St., York.
LANCASHIRE Generators and motors (a.c. and d.c.), synchronous motors, turbo-alternators, planer drives, &c.	Lancashire Dynamo & Motor Co., Ltd., Trafford Park, Manchester, associated with The Crypto Electrical Co., Ltd., Acton Lane, Willesden, N.W.10.
LATASCALE Indicating instruments	Elliott Bros. (London), Ltd., Century Works, Lewisham, S.E.13.
LAURIE & INGLEFIELD Travelling lights and stretching pendants	Thos. Laurie & Co., Ltd., West End, Falkirk.
LEATHEROID Insulating materials	Mosses & Mitchell, Ltd., Chiswell Works, 60-64, Ironmonger Row, E.C.1.
LEATHEROID Insulating materials	Attwater & Sons, Hopwood St. Mills, Preston.
LEATHEROID Insulating materials	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
L.E.C. Switchgear, conduits, cables and wireless accessories	The London Electrical Co., 1, Sherborne Lane, E.C.4.
LECITE (Regd.) Electric cables and wires	The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool.
LECITON (Regd.) Electric cables and wires	The Liverpool Electric Cable Co., Ltd., Bootle, Liverpool.
LECOID (Regd.) Box filling compounds for electric cable jointing	The Liverpool Elec. Cable Co., Ltd., Bootle, Liverpool.
LEKTRIK (Regd.) Switches, plug connectors and kindred accessories	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
LIMPET TAPE Adhesive tape	Connollys (Blackley), Ltd., Blackley Vale Mills, Blackley, Manchester.
LINAPEX Varnished cloths, silks, and tapes	The Ioco Rubber & Waterproofing Co., Ltd., Netherton Works, Anniesland, Glasgow, W.3.
LINCOLN Switches, accessories and switchgear	J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall.
LINK Clips for fixing metal sheathed house wires	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
LINOLITE Strip reflector fittings for shop-window, cornice and picture lighting	A. W. Beuttell, Ltd., 96, Victoria St., S.W.1.
LITHOLITE Moulded insulators	Litholite Insulators, Ltd., 55-57, Hackney Grove, London, E.8.
LITTLE GIANT Electric and pneumatic portable hand drills	The Consolidated Pneumatic Tool Co., Ltd., Egyptian House, 170, Piccadilly, W.1.
LIVERPOOL CABLES Electric cables and wires	The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool.
L.K. House service meters, overhead line switchgear, lighting accessories	Elkay Electrical Mfg. Co., Ltd., 4, Southampton Row, W.C.1.
L.K. Wireless all-mains electric receivers, loud-speakers, &c.	Elkay Electrical Mfg. Co., Ltd., 4, Southampton Row, W.C.1.
LOHYS Electrical sheets and stampings ...	Joseph Sankey & Sons, Ltd., Bilston, Staffs.
LORIVAL Insulating materials, rod, sheet, and tube, synthetic resin and all plastic mouldings	Lorival Mfg. Co. (1921), Ltd., Norwood Works, Southall, Middlesex.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
L.P.S. Battery and test clips	L.P.S. Electrical Co., Ltd., Ealing Rd., Alperton, Middlesex.
LUNDBERG Switches, plug connectors and kindred accessories	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
LUXRAY Glassware lighting units	Downes & Davies, 1 & 3, Stanley St., Liverpool.
LYRIC Fittings wire	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
M. & C. Open type switch and control gear, ironclad switch and control gear, flameproof switch and control gear	Mavor & Coulson, Ltd., 47, Broad St., Mile End, Glasgow.
MACADIE Automatic coil winder	The Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, Douglas St., S.W.1.
MACINTOSH Paper and rubber insulated cables	The Macintosh Cable Co., Ltd., Derby.
MACINTOSH Wiring systems	The Macintosh Cable Co., Ltd., Derby.
MACOBOND Wiring system	The Macintosh Cable Co., Ltd., Derby.
MACOMET Wiring system	The Macintosh Cable Co., Ltd., Derby.
MACONITE Electric wires and cables	The Macintosh Cable Co., Ltd., Derby.
MAGICLOG Electric log fires	Berry's Electric (1928), Ltd., 85-86, Newman St., Oxford St., W.1.
MAGICOAL Electric fires	Berry's Electric (1928), Ltd., 85-86, Newman St., Oxford St., W.1.
MAGNALL-IRVING Thrust-borer for laying underground cables, pipes, &c.	The Hydraulic Engg. Co., Ltd., Chester.
MAGNET Electric fans of every description ...	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
MAGNET Household electric appliances for heating, cooking, washing, cleaning, ironing, &c.	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
MAGNET Wiring systems for general and industrial purposes	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
MAGNET Conduits, fittings and accessories ...	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
MAGNET Batteries	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
MAGNET Furnaces and ovens for all industrial purposes	The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.
MANOR Cookers, fires, water heaters ...	The Manor Electric Oven & Fire Co., 7, Sutton St., Charing Cross Rd., W.1.
MANSON Adhesive protecting tape	William Geipel, Ltd., Vulcan Works, 156-170, Bermondsey St., S.E.1.
MARANEX Ship wiring cables	Callender's Cable & Construction Co., Ltd., Hamilton House, E.C.4.
MARCONI Thermionic valves for transmission and reception for both general and special purposes	M.O. Valve Co., Ltd., Osram Works, Brook Green, Hammersmith.
MARELLI Electric fans	Marelli & Co., Ltd., 19-20, Garlick Hill, E.C.
MARTINDALE Commstones, portable electric blowers, mica undercutters	Martindale Electric Co., Ltd., The Hyde, Hendon, N.W.9.
MARVEL Tumbler switches for variable control from two or more positions	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
MASTA Ironclad fuse-switches	Berry's Electric (1928), Ltd., 85-86, Newman St., Oxford St., W.1.
MAXEI Vacuum impregnating plant, coil and armature winding machines, coreplate varnishing machines	Soc. Anon. Machines Auxiliares Pour l'Electricité and l'Industrie, 66, Victoria St., S.W.1.
MAXHEAT Oval tubular electric heaters ...	The Wardle Engg. Co., Ltd., Old Trafford, Manchester.
MAXIGRAPH Chart recording maximum demand instruments	Landis & Gyr, Ltd., Elgee Works, Victoria Rd., North Acton, W.3.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
MAXIM Electric lamps	Poynter, Griffiths & Co., Ltd., Maxim Works, 75, Canonbury Rd., N.1.
MAXTORQ Squirrel-cage type induction motors (single, two and three-speed type)	Lancashire Dynamo & Motor Co., Ltd., Trafford Park, Manchester, associated with The Crypto Electrical Co., Ltd., Acton Lane, Willesden, London, N.W.10.
MAYTAG Electric clothes washer	Hotpoint Electric Appliance Co., Ltd., 24, Newman St., Oxford St., W.1.
MAZDA Electric lamps	The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.
M.C.L. & REPETITION Automatic screw machine products	M.C.L. & Repetition, Ltd., Pool Lane, Langley, Birmingham.
M.E.C. Small electric motors, a.c. and d.c.	The Medical Engineering Co., Ltd., Englefield Rd., N.1.
MECVENT Organ-blowing equipments, forge blower, industrial fans, &c.	Millns Electrical Co., 17, Whitefriars St., E.C.4.
MEDIUM RESISTANCE Special high-quality dynamo sheets and stampings	Joseph Sankey & Sons, Ltd., Bilston, Staffs.
MEGGER Electrical instruments	Evershed & Vignoles, Ltd., Acton Lane Wks., London, W.4.
MEGOHMOID Cable materials	Lindsay & Williams, Ltd., Openshaw Bridge Works, Ashton Old Rd., Openshaw, Manchester.
MEMETTE Ironclad switches	Midland Electric Mfg. Co., Ltd., M.E.M. Works, Barford St., Birmingham.
MEM8 Insulated switches and fuses ...	Midland Electric Mfg. Co., Ltd., M.E.M. Works, Barford St., Birmingham.
MEMOTA Motor starting switches	Midland Elec. Mnfg. Co., Ltd., Barford St., Birmingham.
MEMREX Ironclad switches	Midland Electric Mfg. Co., Ltd., M.E.M. Works, Barford St., Birmingham.
MEMSET Splitters (D.P. switch with 4 S.P. fuses)	Midland Electric Mfg. Co., Ltd., M.E.M. Works, Barford St., Birmingham.
MEMWAY Distribution boards	Midland Elec. Mnfg. Co., Ltd., Barford St., Birmingham.
MERSEY Motors and dynamos	City Electrical Co., 1, Emerald St., W.C.1.
MERSEY CABLES Rubber-insulated wires and cables	Mersey Cable Works, Ltd., Linacre Lane, Bootle, Liverpool.
METROHM Insulation testing set	Everett, Edgcumbe & Co., Ltd., Colindale Works, Hendon, N.W.9.
METROVICK Electrical apparatus	Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.
MICA Block splittings, washers, &c. ...	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
MICANITE Insulating sheet, tubes, washers, &c.	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
MIDGET MASTA Fuse switch	Berry's Electric 1928), Ltd., 85-86, Newman St., Oxford St., W.1.
MILL Circuit breakers	Geo. Ellison, Ltd., Perry Barr, Birmingham.
MINERVA Grey enamel for insulating all classes of electrical windings where heat dissipation is desired	Pinchin, Johnson & Co., Ltd., General Bldgs., Aldwych, W.C.2.
MINIMAX Bakelite 2, 3 and 4 pin side-entry cord-grip plugs	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
MINISQUARE Electrical instruments	Everett, Edgcumbe & Co., Ltd., Colindale Works, Hendon, N.W.9.
MODINE Unit cabinet, blast and concealed heaters	S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.1.
MOONSTONE Glassware	Underwood (Manchester), Ltd., 1, Dickinson St., Manchester.
MORCO Illuminating glassware, electrical accessories, electric irons	T. B. Morley & Co., Ltd., Jameson St., Hull.
MORGANITE Brushes	The Morgan Crucible Co., Ltd., Battersea Works, Church Rd., S.W.11.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
MORGANITE Electric radiators	Barker, Young & Co., Ltd., 47, Victoria St., S.W.1.
MORTISE Single-way small narrow-panel tumbler switches	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
MOULDENSITE Moulding materials	Bakelite, Ltd., 68, Victoria St., S.W.1.
M.P.L. Bakelite electric table standards ...	Mayall & Co., Ltd., 61, Moor St., Birmingham.
MULTI-BOILER Electric boiling ring (boils three vegetables at once)	Premier Electric Heaters, Ltd., Keeley St., Birmingham.
MYCALEX Insulation products	Mycalex (Parent) Co., Ltd., 328, Abbey House, Westminster, S.W.1.
NALDERS Electrical measuring instruments and relays of all types	Nalder Bros. & Thompson, Ltd., 97a, Dalston Lane, E.8.
N.B.D. Electrical plant	Haslam & Newton, Ltd., Formerly Newton Bros. (Derby), Ltd., Alfreton Rd., Derby.
N.C.S. Electrical measuring instruments and relays of all types	Nalder Bros. & Thompson, Ltd., 97a, Dalston Lane, E.8.
NECO Electric motors ¼ to 1 h.p., a.c. and d.c.	Normand Electrical Co., Ltd., 3, North Side, Clapham Common, S.W.4.
NEOPHONE The new high-efficiency central battery telephone of the micro-telephone pattern, standardised by the British P.O.	Siemens Brothers & Co., Ltd., Woolwich, S.E.18.
NEWBERRY Magicoal fires	Berry's Electric (1928), Ltd., 85-86, Newman St., Oxford St., W.1.
NEWBRIDGE Time switches	Horstmann Gear Co., Ltd., Newbridge Works, Bath.
NEWTONS OF TAUNTON A.c. and d.c. dynamos and motors, l.t. switchgear, &c.	Newtons of Taunton, 3, Cavendish Place, Regent St., W.1.
NICHRO Electric domestic irons	Cranmer & Cheshire, 9, Steward St., Spring Hill, Birmingham.
NICO Fittings, glassware and accessories	Nico Light Co., Ltd., 19, Farringdon Avenue, E.C.
NIPHAN Couplings and plugs for cables ...	Simmonds & Stokes, Ltd., 4, Vernon Place, Southampton Row, W.C.1.
NO-LAG Power factor correction motors ...	British Thomson-Houston Co., Ltd., Rugby.
NOMAG Non-magnetic iron	Ferranti, Ltd., Hollinwood, Lancashire, and Bush House, W.C.2.
NOMET Special wiring system and fittings	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
NOVEL Switch, 5-amp. tumbler type, fitted with extra terminal for looping	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
OASIS Accumulator acid, acid-resisting paints, battery testers	General Chemical & Pharmaceutical Co., Ltd., Judex Works, Sudbury, Middlesex.
OHMALINE Insulating varnish	Griffiths Bros. & Co., London, Ltd., Macks Rd., S.E.16.
OHMER Insulating testing sets	Nalder Bros. & Thompson, Ltd., 97a, Dalston Lane, E.8.
OKONITE Insulating tape	William Geipel, Ltd., Vulcan Works, 156-170, Bermondsey St., S.E.1.
OLONITE Cable insulation and protection ...	The Croydon Cable Works, Ltd., formerly known as The Greenwich Cable Works, Ltd., Mitcham Rd., Croydon.
OMEGA Gasfilled and vacuum electric lamps of all kinds	Omega Lampworks, Ltd., Rodney Place, Merton Abbey, S.W.19.
OSRAM Thermionic valves for transmission and reception for both general and special purposes	M.O. Valve Co., Ltd., Osram Works, Brook Green, Hammersmith.
OSRAM Electric lamps for all conditions of lighting	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
OSRAM Wireless valves of all types for general and special requirements	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
OWL Electrical porcelain	Geo. Wade & Son, Ltd., Manchester Pottery, High St., Burslem, Staffs.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
OZONAIR Ozone apparatus, pure air ventilation	Ozonair, Ltd., Ozonair House, St. Leonard St., S.W.1.
P. & G. Accumulators	Pritchett & Gold & E.P.S. Co., Ltd., 50, Grosvenor Gardens, S.W.1.
P. & R. Accumulators	Peto & Radford, Props.: Pritchett & Gold and E.P.S. Co., Ltd., 50, Grosvenor Gardens, S.W.1.
PAKYDERM Finishing varnish	Griffiths Bros. & Co., London, Ltd., Macks Rd., S.E.16.
PAXOLIN Bakelite varnish-paper boards, tubes, cylinders	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
PAXOLIN Transformer and switchgear bushings, insulators, &c.	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
PEERLESS Insulator and fibre	Attwater & Sons, Hopwood Street Mills, Preston.
PEERLESS Single-phase repulsion induction motors, generators and fans	S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.1.
PEERLESS Insulation paper	J. Burns, Ltd., Wangye Works, Chadwell Heath, Essex.
PEERLESS Insulation	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
PERCO-WASH Electric clothes-washing device and washboiler	The Jackson Electric Stove Co., Ltd., 143, Sloane St., S.W.1.
PERMALLOY Magnetic alloy	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
PERNAX Cable insulation, bird guards ...	The Croydon Cable Works, Ltd., formerly known as The Greenwich Cable Works, Ltd., Mitcham Rd., Croydon.
PERTINAX Special bakelite board, tubes and rods	Geo. L. Scott & Co., Ltd., 86-88, Acre Lane, Brixton, S.W.2.
PETROLEX Fire extinguishers for electrical equipment	Read & Campbell, Ltd., 75, Victoria St., Westminster, S.W.1.
PHENOLITE Laminated bakelite	J. Burns, Ltd., Wangye Works, Chadwell Heath, Essex.
PHILILITE Totally-enclosed diffusing units ...	Philips Lamps, Ltd., 145, Charing Cross Rd., W.C.2.
PHILIPS Wireless and lamps	Philips Lamps, Ltd., Philips House, 145, Charing Cross Rd., W.C.2.
PHILIRAY Shop window reflectors	Philips Lamps, Ltd., 145, Charing Cross Rd., W.C.2.
PHILITE Synthetic resins, plastics, etc., and articles made therefrom	Philips Lamps, Ltd., Philips House, 145, Charing Cross Rd., W.C.2.
PHILUMA Local lighting industrial units ...	Philips Lamps, Ltd., 145, Charing Cross Rd., W.C.2.
PHLATTA Switches	The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
PHONOPORE Telephones for superimposing on telegraph lines	The Phœnix Telephone & Electric Works, Ltd., The Hyde, Edgware Rd., Hendon, N.W.9.
PIRELLI-GENERAL Wires, cables and flexibles ...	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
PIVOT Single, two-way, &c., tumbler switches and combinations	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
PIXY Bell pushes with straight-line movement	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
PNEUCONEX Grit catchers	Pneumatic Conveyance & Extraction (1929), Ltd., Broadway Buildings, Broadway, S.W.1.
PNEUCONEX Pneumatic coal, ash, and grain handling plants	Pneumatic Conveyance & Extraction (1929), Ltd., Broadway Buildings, Broadway, S.W.1.
PNEUCONEX Pneumatic flue dust extraction equipment	Pneumatic Conveyance & Extraction (1929), Ltd., Broadway Buildings, Broadway, S.W.1.
POINTOLITE Lamps	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
PREMIER Electric fires, irons, kettles, &c. ...	Premier Electric Heaters, Ltd., Keeley St., and St. Andrew's Rd., Birmingham.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
PREMIER Accumulators	Premier Accumulator Co., 50, Grosvenor Gardens, S.W.1.
PREMIER DUPLEX Electric vacuum cleaner	Hotpoint Electrical Appliance Co., Ltd., 24, Newman St., Oxford St., W.1.
PREMIER JUNIOR Electric vacuum cleaner	Hotpoint Electrical Appliance Co., Ltd., 24, Newman St., W.1.
PRESCOT Box compounds	British Insulated Cables, Ltd., Prescot, Lancs.
PRESCOT Feeder pillars	British Insulated Cables, Ltd., Prescot, Lancs.
PRESCOT Joint boxes	British Insulated Cables, Ltd., Prescot, Lancs.
PRESCOT Overhead equipment for electric railways and tramways	British Insulated Cables, Ltd., Prescot, Lancs.
PRESCOT Paper insulated cables	British Insulated Cables, Ltd., Prescot, Lancs.
PRESCOT Cotton-covered wires	British Insulated Cables, Ltd., Prescot, Lancs.
PRESSPAHN Insulating board in all thicknesses	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
PRISMAT Directional bulkhead fitting ...	The Wardle Engg. Co., Ltd., Elsinore Rd., Old Trafford, Manchester.
PRISMATIC Bulkhead fitting	Berry's Electric (1928), Ltd., 85-86, Newman St., Oxford St., W.1.
PROCELL (Regd.) Corrosion-proof rubber insulated cable	Mersey Cable Works, Ltd., Linacre Lane, Bootle, Liverpool.
PROMETHEUS Electric irons, radiators, water heaters, &c.	Dowsing Radiant Heat Co., Ltd., Bollo Lane, Acton, W.3, and 91-3, Baker St., W.1.
PUL-SYN-ETIC Electric impulse clocks and time discipline apparatus	Gent & Co., Ltd., Faraday Works, Leicester.
QUASI-ARC Electrodes and welding equipment	Quasi Arc Co., Ltd., 15, Grosvenor Gardens, S.W.1.
QUEAD Electric fires and cookers	William Geipel, Ltd., Vulcan Works, 156-170, Bermondsey St., S.E.1.
QUICKSET Automatic electric safety kettles ...	Premier Electric Heaters, Ltd., Keeley St. and St. Andrew's Rd., Birmingham.
QUICKWAY Armature and stator coil-winding and forming machinery	Midland Dynamo Co., Ltd., 64, Belgrave Gate, Leicester.
RADIODESCENT Appliances for radiant heat treatment	Dowsing Radiant Heat Co., Ltd., Bollo Lane, Acton, W.3, and 91-3, Baker St., W.1.
RADIOMATIC Broadcast receivers, band repeater apparatus	Gent & Co., Ltd., Faraday Works, Leicester.
RADION Insulating material	American Hard Rubber Co. (Britain), Ltd., 95, Hatton Garden, E.C.1.
RADSLOT Hotel radiator prepayment meters	Venner Time Switches, Ltd., Kingston By-Pass Rd., New Malden, Surrey.
RAPPER Percussive hand-drill for wall plugs	Wm. Geipel, Ltd., Vulcan Works, 156-170, Bermondsey St., S.E.1.
RECORD Insulation testers, battery cut-outs, circuit breakers	Record Electrical Co., Ltd., Broadheath, Altrincham, Cheshire.
REESILEO Oils, insulating and lubricating ...	Reesoils, Ltd., 1, Eldon Sq., Newcastle-on-Tyne.
REFLEX Control of pendulums of existing workmen's recorders and other pendulums	Gent & Co., Ltd., Faraday Works, Leicester.
REGAL Ebonite	Spicers, Ltd., 19, New Bridge St., E.C.4.
RELIANCE Circuit breakers	Whipp & Bourne, Ltd., Castleton, Manchester.
REPELLITE Insulating sheets	Spicers, Ltd., 19, New Bridge St., E.C.4.
RESILIA Pyrometers, electrical high precision instruments, miniature electrical instruments	Foster Instrument Co., Letchworth, Herts.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
RESISTON Insulating material	American Hard Rubber Co. (Britain), Ltd., 95, Hatton Garden, E.C.1.
REVO Fires and domestic apparatus, cookers, street lighting and industrial fittings	The Revo Electric Co., Ltd., Britannia Works, Tividale, Tipton, Staffs.
REVO Irons, switchgear and fans ...	The Revo Electric Co., Ltd., Britannia Works, Tividale, Tipton, Staffs.
REX A.c. meters	Thompson & Co., 1 & 3, Old Swan Lane, E.C.4.
RHECO Switchboards, industrial fittings ...	Robinson & Hands Electric Co., Ltd., Barwick St., Birmingham.
RINGSDORFF Carbon brushes, brush holders and controller fingers	Ringsdorff Carbons (England), Ltd., Colindale Avenue, N.W.9.
ROYAL EDISWAN Lamps	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
RUPTOR Ironclad switch	W. T. Henley's Telegraph Works, Co., Ltd., Holborn Viaduct, E.C.1.
SADIA Water heaters, time switches, boiling plates, thermostats	Sadia, Ltd., 22, Newman St., W.1.
SAFETEE Ironclad switchgear	L. Weekes (Luton), Ltd., Luton, Beds.
SAFETEE Electrical cartridge-type fuses ...	L. Weekes (Luton), Ltd., Luton, Beds.
SAFETEE Ironclad switchboards	L. Weekes (Luton), Ltd., Luton, Beds.
SALFORD Circuit breakers	General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
SANGAMO-EDISWAN Meters	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
SATCHWELL Thermostats	The Rheostatic Co., Ltd., Mackenzie St., Slough, Bucks.
SAUTER Time switches and thermostats ...	Nathan & Allen, Ltd., 25, Victoria St., London, S.W.1.
SECTOR Electric irons, fires, accessories ...	Electrical Components, Ltd., 88-90, Gt. Charles St., Birmingham.
SEELCO Wiring system comprising lead-alloy sheathed wires and simple accessories	Siemens Elec. Lamps & Supplies, Ltd., 38 & 39, Upper Thames St., E.C.4.
SELCO Syrens, motors, fans	S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.1.
SEMAPHITE Cables	Johnson & Phillips, Ltd., Charlton, S.E.
SERVICE Grid resistances and accessories ...	The Rheostatic Co., Ltd., Mackenzie St., Slough.
SHAKEPROOF Lock washers, locking terminals for vibration proof connections	Barber & Colman, Ltd., Marsland Rd., Brooklands, near Manchester.
SHAYDOLITE Lamp lacquer	Griffiths Bros. & Co., London, Ltd., Macks Rd., S.E.16.
SIEMENS Electric lamps	Siemens Elec. Lamps & Supplies, Ltd., 38 & 39, Upper Thames St., E.C.4.
SIEMENS Electric pyrometers and distance thermometers	Elliott Bros. (London), Ltd., Century Works, Lewisham, S.E.13.
SIEMENS Batteries—fluid and dry	Siemens Brothers & Co., Ltd., Woolwich, S.E.18.
SIEMENS Ebonite	Siemens Brothers & Co., Ltd., Woolwich, S.E.18.
SIEMENS Joint boxes, feeder pillars, house service fuse boxes	Siemens Brothers & Co., Ltd., Woolwich, S.E.18.
SIEMENS Electric cables and wires of all types	Siemens Brothers & Co., Ltd., Woolwich, S.E.18.
SIFAM Measuring instruments, recorders, electricity meters	Sifam Electric Instrument Co., Ltd., Bush House, Aldwych, W.C.2.
SILUMINITE Insulating and arc-resisting mouldings	Turner's Asbestos Cement, Ltd., Trafford Park, Manchester.
SILVALUX Electric lamps (opal)	Siemens Elec. Lamps & Supplies, Ltd., 38 & 39, Upper Thames St., E.C.4.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
SILVARAY One-piece glassware fittings ...	Siemens Elec. Lamps & Supplies, Ltd., 38 & 39, Upper Thames St., E.C.4.
SIMPLEX Conduits and all electric installation equipment	Simplex Conduits, Ltd., Garrison Lane, Birmingham.
SIMPLEX "Ordinary" and "Reverse" door contacts	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
SINDANYO Insulating and arc-resisting boards	Turner's Asbestos Cement, Ltd., Trafford Park, Manchester.
SIROCCO Fans	Davidson & Co., Ltd., Sirocco Eng. Works, Belfast, Ireland.
SISSON Enclosed self-lubricating and open-type steam engines, steam-driven dynamos complete	W. Sisson & Co., Ltd., Elmbridge Rd., Gloucester.
SISTOFLEX Insulating sleeving, fibre and leatheroid	Spicers, Ltd., 19, New Bridge St., E.C.4.
SISTOFLEX Varnished cloth, paper, tapes, &c.	Spicers, Ltd., 19, New Bridge St., E.C.4.
SLOTTED STEEL For switchgear frames, outdoor sign frames, cable carriers, &c.	Constructors, Ltd., Nickel Works, Tyburn Rd., Erdington, Birmingham.
SMOOTHWELL Electric irons	Premier Electric Heaters, Ltd., Keeley St. and St. Andrew's Rd., Birmingham.
SOLARIUM Electric sun baths	Dowsing Radiant Heat Co., Ltd., Bollo Lane, Acton, W.3, and 91-3, Baker St., W.1.
SOLBIT Solid bitumen mining cables ...	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
SOTONITE Insulated cables	Pirelli-General Cable Works, Ltd., Southampton and Eastleigh.
S P High- and low-tension insulators for transmission lines, bushings and porcelain parts for every purpose and all voltages, pressed steatite pieces for all low-tension uses	Steatite & Porcelain Products, Ltd., Stourport, Worcs.
SPECIAL LOHYS Electrical sheets and stampings ...	Joseph Sankey & Sons, Ltd., Bilston, Staffs.
SPEEDFIX Patent self-centering terminals ...	The General Accessories Co., Ltd., 18-22, Euston Buildings, George St., N.W.1.
SPENCER-BONECOURT Waste Heat Boilers, Economisers, Kirke Patent Boilers, &c.	Spencer-Bonecourt, Ltd., Broadway Buildings, S.W.1.
STALLOY Transformer sheets and stampings, telephone and loud-speaker diaphragms	Joseph Sankey & Sons, Ltd., Bilston, Staffs.
STANDARD Cables of all types	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
STANDARD Public address systems	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
STANDARD Telephones for all purposes, manual and automatic	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
STANDARD Traffic control system	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
STANDARD Wireless transmitting and receiving apparatus	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
STANNOS WIRING SYSTEM V.I.R. wires protected by a watertight tinned copper sheathing suitable for concentric or two-wire installation	Siemens Brothers & Co., Ltd., Woolwich, S.E.18.
STEATAIN High- and low-tension insulators for transmission lines, bushings and porcelain parts for every purpose and all voltages, pressed steatite pieces for all low-tension uses	Steatite & Porcelain Products, Ltd., Stourport, Worcs.
STERLING Insulating varnishes, solid impregnating compounds, wire enamels	The Sterling Varnish Co., Fraser Rd., Trafford Park, Manchester.
STOKES Electric table cookers—to cook on a plate without pots or pans	The Stokes Table Cooker Co., 125, Water Lane, Leeds.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
STRAIGHT-LITE Reflector fittings for shop windows, cornice and picture lighting, straight-lite tubular signs	Straight-Lite Reflectors, Ltd., Oxford House, 9-15, Oxford St., W.1.
STROWGER Public automatic telephones and exchange equipment, private automatic exchanges	Automatic Telephone Manufacturing Co., Ltd., Strowger Works, Milton Rd., Edge Lane, Liverpool.
SUDDEUTSCHE Cable and flexible	"Z" Electric Lamp & Supplies Co., Ltd., 21, Newman St., W.1.
SUNBEAM Magicoal fire	Berry's Electric (1928), Ltd., 85-86, Newman St., Oxford St., W.1.
SUNBERRY Magicoal electric fire	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
SUNDOWN Magicoal electric fire	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
SUNRAY (Tricity) radiators	The British Electric Transformer Co., Ltd. (Sunray Tricity Dept.), Wellington House, 125-130, Strand, W.C.2.
SUPASTONE Illuminating lighting glassware ...	Wholesale Fittings Co., Ltd., 23-27, Commercial St., E.1.
SUPER-BOX House-wiring joint box	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
SUPERLUX Glassware	The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.
SUPERSCALE Indicating instruments	Everett, Edgcumbe & Co., Ltd., Colindale Works, Hendon, N.W.9.
SUPER SEASONED Vulcanised fibre	J. Burns, Ltd., Wangye Works, Chadwell Heath, Essex.
SWAN BRAND Electric cooking utensils, sterilisers, and pedestal heaters	Mayall & Co., Ltd., 61, Moor St., Birmingham.
SYNCHRONOME Electric clocks	Synchronome Co., Ltd., 32-4, Clerkenwell Rd., E.C.1.
SYNCLOCK Electrical clocks	Everett, Edgcumbe & Co., Ltd., Colindale Works, Hendon, N.W.9.
TANGENT Sound signals, ironcased and woodcased self-winding clocks, and RADIO apparatus	Gent & Co., Ltd., Faraday Works, Leicester.
TATE Electrical valve control	James Tate & Co., Victory Works, Bradford.
T.C.C. Paper condensers, mica condensers, power factor improvement condensers	Telegraph Condenser Co., Ltd., Wales Farm Rd., North Acton, W.3.
TELAC Tumbler switches, accessories, switchgear, ironclad gear	J. H. Tucker & Co., Ltd., King's Rd., Tyseley, Birmingham.
TELENDURON Battery containers	Thos. de la Rue & Co., Ltd., Shernhall St., Walthamstow, E.17.
TELENDURON Insulators for telegraph and telephone lines, also insulation mouldings for electrical trade	Thos. de la Rue & Co., Ltd., Shernhall St., Walthamstow, E.17.
TENACIT Bakelite material for hot and cold mouldings up to largest sizes	A.E.G. Electric Co., Ltd., 131, Victoria St., Westminster, S.W.1.
TENBY Junction boxes, clips, saddles, &c.	S. O. Bowker, Ltd., 20, Branston St., Birmingham.
TERRA-GRIP Continuity wiring system	Simplex Conduits, Ltd., Garrison Lane, Birmingham.
TERRAPIN (Regd.) Two-pin and "earth" plug connectors	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
TEST SHEATH Test conductor for underground electric cables	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
THERMOID Flexible cord	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
THISTLE Conduit tubes and fittings	James McDougall, Ltd., Wednesbury, Staffs.
THISTLE BRAND Galvanised span and guard wire strand to M.T.A. specification	Frederick Smith & Co. Wire Manufacturers, Ltd., Halifax.
THISTLE BRAND Tinned steel armature binding wire	Frederick Smith & Co. Wire Manufacturers, Ltd., Halifax.
THOR Washers, irons, vacuum cleaners, juvenators	Hurley Machine Co. (England), Ltd., 245, Oxford St., W.1.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
THREE STAR Accumulators	Three Star Accumulators, Ltd., Rosebery Avenue, N.17.
TIRRILL Automatic voltage regulators ...	British Thomson-Houston Co., Ltd., Rugby.
TREFOIL Bakelite synthetic resin products, *i.e.*, bakelite sheet and tubes	Bakelite, Ltd., 68, Victoria St., S.W.1.
TREVA Electrical accessories, lampholders, switches, etc.	Trevelyans (B'ham), Ltd., 155, Bracebridge St., Birmingham.
TRICITY Cookers	The British Electric Transformer Co., Ltd., Hayes, Middlesex.
TRICITY Cookers and tableware	The British Electric Transformer Co., Ltd. (Sunray Tricity Dept.), Wellington House, 125-130, Strand, W.C.2.
TRICITY Electric fires	The British Electric Transformer Co., Ltd., 125-130, Strand, W.C.2.
TRIPIN (Regd.) Three-pin plug connector (all current-carrying pins)	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
TRIPOLIT Triple pole tumbler switch on a single base, positive quick make and break	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
TRIUMPH Fuses, ironclad fuse gear, "Castle" plugs and sockets	Castle Fuse & Engineering Co., Ltd., 33, Chester St., Liverpool.
TRIVECTOR Indicating and recording instrument giving kW Max., kVa Max., kVa sin ϕ Max., and consumption on all three components	Landis & Gyr, Ltd., Elgee Works, Victoria Rd., North Acton, W.3.
TUCKER Tumbler switches, accessories, switchgear, ironclad gear	J. H. Tucker & Co., Ltd., King's Rd., Tyseley, Birmingham.
TUDOR Accumulators	Tudor Accumulator Co., Ltd., 59, Grosvenor Gardens, Westminster, S.W.1.
TUFNOL Tube, rod and panel insulation ...	Ellison Insulations, Ltd., Wellhead Lane, Perry Barr, Birmingham.
TUNGSRAM Lamps, wireless valves and photo cells	Tungsram Electric Lamp Works (Great Britain), Ltd., Commerce House, 72, Oxford St., W.1.
TUNGSTALITE Electric lamps	Tungstalite, Ltd., 47, Farringdon Rd., E.C.1.
TURBAX Fabric bakelite for electrical purposes and mechanical gearing	Dacier, Ltd., 8, 10 & 12, Wagner St., Old Kent Rd., S.E.15.
TURRET Multiple-way two-pin plug connector (3 to 6 ways)	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
TWINOB (Regd.) Tumbler switch (either, both or "off"), also a.c. motor control and switch plug	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
TYPERLITE Lighting standard for typewriters, office machines and all purposes	The Typerlite Co., 86, Cannon St., E.C.4.
ULTRALITE One piece glassware fittings ...	Siemens Elec. Lamps & Supplies, Ltd., 38 & 39, Upper Thames St., E.C.4.
UNIBOND Metal sheathed surface wiring system with bonding wire	The Union Cable Co., Ltd., Dagenham Dock, Essex.
U.N.I.TALK Telephones	W. C. Davey & Co., Mortimer Market, W.C.1.
UNITEM "Two-service" adaptor, B.C., 2-pin (adjustable)	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
UNIVERSAL House-wiring joint box	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
VANDUARA Insulating tapes, insulating materials	John MacLennan & Co., 115, Newgate St., London, E.C.1.
V.C. Switch for vacuum cleaners and other portable apparatus	A. P. Lundberg & Sons, Ltd., Pioneer Elecl. Wks., Paradise Passage, Sheringham Rd., N.7.
VEETA Quick make-and-break switches ...	The General Accessories Co., Ltd., 18-22, Euston Buildings, George St., N.W.1.
VENOFF Photographic and sunray time switch	Venner Time Switches, Ltd., Kingston By-Pass Rd., New Malden, Surrey.
VENTEX Air filter	Ozonair, Ltd., St. Leonard St., S.W.1.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM
VIKING Fuse switch	Berry's Electric (1928), Ltd., 85-86, Newman St., Oxford St., W.1.
VINCENT Switch fuse	Vincent Switchgear Mfg. Co., Ltd., Sampson Rd. North, Birmingham.
VIRCLAD Cables	Electric Cables, Ltd., 25, Old St., E.C.1.
VISCO Air filter	Visco Engineering Co., Ltd., 162, Grosvenor Rd., S.W.1.
VULMOS Vulcanised fibre and leatheroid ...	Mosses & Mitchell, Ltd., Chiswell Works, 60-64, Iron monger Row, E.C.1.
W Fire and burglar alarms, float switches, water levels and tell-tales	Cox Walkers, North Eastern Electric Works, Darlington.
WALSALL Steel conduits and fittings	Walsall Conduits, Ltd., Excelsior Works, West Bromwich.
WARD LEONARD Resistances, dimmers and rheostats	William Geipel, Ltd., Vulcan Works, 156-170, Bermondsey St., S.E.1.
WARDELYTE Glassware units	The Wardle Engg. Co., Ltd., Old Trafford, Manchester.
WARWICK Switch and fuse gear, electric light fittings, and lampholders	William McGeoch & Co., Ltd., Warwick Works, 46, Coventry Rd., Birmingham.
"W.E." All classes of conduit fittings ...	Bernard & Co., 9, Horseferry Rd., S.W.1.
WELDRICS IMPROVED GRADE A Arc welding electrodes	Weldrics (1922), Ltd., Station Rd., Beeston, Notts.
WELLS Waste oil filters	A. C. Wells & Co., Ltd., Carnarvon St., Cheetham, Manchester.
WEMBLEY Street-lighting lanterns	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
WESTMINSTER Carbon brush holders, arc lamps (photo and medical), electric welding machines	Westminster Engineering Co., Victoria Rd., N.W.10.
WESTON Electrical measuring instruments, instruments for radio service, high frequency thermo instruments	Weston Elecl. Instrument Co., Ltd., 15, Gt. Saffron Hill., E.C.1.
WHITE TILE Water heaters	White Tile Heaters, Ltd., Clementhorpe Works, off Charlton St., York.
WILD BARFIELD Furnaces and muffles	Wild-Barfield Electric Furnaces, Ltd., Elecfurn Works, North Rd., Holloway, N.7.
WILMIL Aluminium castings	Wm. Mills, Ltd., Grove St., Birmingham.
WINTA Radiator	Berry's Electric (1928), Ltd., 85-6, Newman St., W.1.
WITTON Electric motors for domestic and industrial uses	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
WITTONITE Insulating mouldings	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
WOLF Portable electric tools	S. Wolf & Co., Ltd., 115, Southwark St., Blackfriars Bridge, S.E.1.
WYLEX Switch plugs	George H. Scholes & Co., Ltd., Blantyre St., Hulme, Manchester.
XCEL Electric heating and cooking appliances	Automatic Telephone Mfg. Co., Ltd., Strowger Works, Milton Rd., Edge Lane, Liverpool.
XCEL Electric domestic appliances ...	Siemens Elec. Lamps & Supplies, Ltd., 38 & 39, Upper Thames St., E.C.4.
XCEL Electric and cooking appliances ...	Downes & Davies, 1 & 3, Stanley St., Liverpool.
XTRA-POINT Lampholder and plug	W. E. Beardsall & Co., Ltd., Victoria Bridge, Manchester.
Y & W Accessories and domestic appliances	Young & Wildsmith, Ltd., 35, Little Russell St., W.C.1.
Z Wiring supplies	"Z" Electric Lamp & Supplies Co., Ltd., 21, Newman St., W.1.
ZED Fuses	Siemens Elec. Lamps & Supplies, Ltd., 38 & 39, Upper Thames St., E.C.4.
ZEISS IKON Reflector fittings for shop windows, offices, industrial and public lighting, street and flood lights	Zeiss Ikon, Ltd., Mortimer House, 37-41, Mortimer St., W.1.